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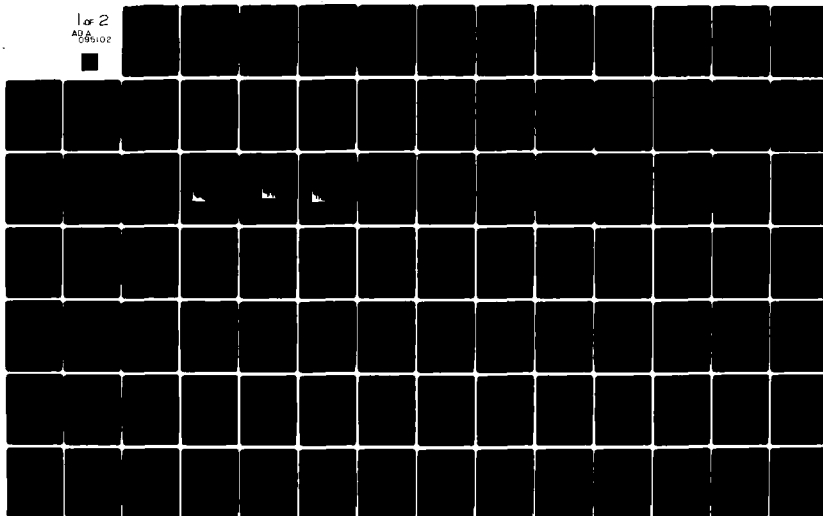
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<p>This study examines the U.S. Coast Guard Vessel Traffic Service program with emphasis on the cost-benefit analysis used to justify the installation of the first six systems. The difficulties with Marine casualty data are examined and some proposed changes are outline. The conclusion of the study is that Vessel Traffic systems are a cost-effective means of improving maritime safety within U.S. ports and waterways.</p>		

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SERVICE PROGRAM,

BY

(10) PAUL J. POTTER, CDR, USCG  
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## EXECUTIVE SUMMARY

In 1972, the Congress enacted the Ports and Waterways Safety Act which empowered the U.S. Coast Guard to develop Vessel Traffic Service (VTS) systems in the United States. Since that time, the Coast Guard has examined the requirements for VTS systems in United States ports and waterways and has installed six VTS systems.

The purpose of this paper is to examine the history of VTS development, examine the cost-benefit analysis used to justify federal funds for construction of the first VTS systems and to address some of the problems associated with the cost-benefit analysis and with the present pattern of VTS system development in the United States.

The scope of the paper is limited to U.S. Coast Guard Vessel Traffic Service system development and does not address foreign systems except to compare and contrast future development alternatives.

The study concludes that VTS systems are highly effective in preventing marine casualties and development of more sophisticated systems should continue.

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## CHAPTER I

### INTRODUCTION

Control of marine traffic has become an increasingly important issue in the United States as the volume of traffic increases with an attendant increase in the number of marine accidents. No other nation in the world has the number of ports nor the variety of industries that rely on waterborne transportation as does the United States. The Coast Guard has identified 212 ports and waterways which should have their vessel traffic management needs examined. The number of commercial vessel transits through these ports and waterways has increased dramatically from about 3.0 million in 1960 to about 3.9 million in 1970. It is projected that the number of transits will reach 5.7 million by 1985.

The potential for commercial vessel accidents resulting in loss of life, personal injury, loss of economic goods and services and damage to the ecology is expected to increase accordingly. The U.S. Army Corps of Engineers and the Maritime Administration have forecast that total commercial cargo transported through U.S. ports and waterways will increase from 1.1 billion tons in 1960 to 3.4 billion tons by 1985. Hazardous cargo and potentially polluting cargo are projected to increase from 659 million tons in 1960 to 2.5 billions tons by 1985.<sup>1</sup>

Commercial vessels have increased in size and speed but, in many cases, the maneuverability of the vessels has been dangerously reduced. According to a 1972 report by the Senate Committee on Commerce on the proposed Ports and Waterways Safety Act of 1972, a 17,000 ton tanker can "crash stop" within half a mile in about five minutes. However, a 200,000 ton tanker takes 2½ miles and twenty-one minutes to stop. In addition, during these "crash stops" these vessels cannot be adequately steered.

Title 46 U.S. Code of Federal Regulations (CFR) 4.05-1 requires that marine casualties aboard United States vessels and all other vessels in U.S. waters be reported to the Coast Guard if any of the following conditions is met:

- a. Damage in excess of \$1,500.
- b. Material damage incurred which affects the seaworthiness or efficiency of the vessel.
- c. Stranding or grounding.
- d. Loss of life.
- e. Injury causing any person to remain incapacitated for a period in excess of 72 hours.

In view of the relatively low threshold which requires a report, literally thousands of them are filed each year. In fiscal year 1978, for example, 4,268 reports were filed. Of these reports, there were some 2,320 traffic-related or "moving" accidents.<sup>2</sup>

According to a 1975 study conducted by the National Research Council entitled Human Error in Merchant Marine Safety, it was estimated that 85% of these traffic-related accidents were caused by personnel error. Due to a lack of adequate data, this study was unable to assign causative percentages on an empirical basis. The study panel relied on a general review of literature, a survey of maritime personnel, and the professional experience of the panel members. Their results were listed in priority of importance as:

1. Inattention
2. Ambiguous pilot-master relationship
3. Inefficient bridge design
4. Poor operating procedures
5. Poor physical fitness
6. Poor eyesight
7. Excessive fatigue
8. Excessive alcohol use
9. Excessive personnel turnover
10. High level of calculated risk
11. Inadequate lights and markers
12. Misuse of radar
13. Uncertain use of sound signals
14. Inadequacies of the Rules of the Road

It might be expected that a study concerning "Human Error" would concentrate on personnel faults and play down other accident causes, but there is clearly more to the increase in

marine casualties than poorly trained and incompetent personnel. The increased density of traffic in congested ports and waterways and vessels equipped with marginal navigational equipment have contributed to the problem.<sup>3</sup>

During fiscal years 1971 through 1978, commercial vessel accidents increased from 2,575 to 4,268. Of the accidents in 1974, some 1,900 were vessel collisions, rammings and groundings which were generally considered to be preventable by vessel traffic systems. These 1,900 accidents resulted in about \$80 million in damages to vessels, cargoes and other property. In 1972 there were some 157 vessel collisions and groundings which caused pollution incidents that spilled some 2.2 million gallons of pollutants into U.S. waters. The number of persons killed or injured each year due to a vessel casualty ranged from a low of 177 in 1972 to a high of 270 in 1976.<sup>4</sup>

In order to redress some of these problems, the Congress passed the Ports and Waterways Safety Act of 1972 (33 USC 1221). This act gave the U.S. Coast Guard broad powers to establish, operate and maintain vessel traffic services, to require vessels to use that service, to require vessels to install and use specified navigation and communications equipment and in special circumstances to direct the movements of vessels within the navigable waters of the United States.

These vessel traffic services are intended to assist the vessel operator in the safe navigation of his vessel within

U.S. ports and waterways where vessel traffic congestion and other hazardous conditions present an unacceptable risk of vessel casualties. While many of the factors affecting safe navigation are universal, each vessel traffic service must be designed to meet the unique needs of each port or waterway being served with due regard for local geography and traffic patterns. The same basic methods of vessel traffic management apply in all ports and waterways, but the hardware, software and specific traffic management techniques must be tailored to each area.

Depending on the current status of vessel traffic congestion, weather, visibility and other navigational safety considerations, each vessel traffic service (VTS) will operate in either an informing mode, an advising/directing mode or in a routing mode. In the informing mode, the VTS will operate specifically to increase the quantity, quality and timeliness of information available to the mariner. The VTS will collect vessel position and movement data and navigational safety data for dissemination to vessels in the system area. This information might include the identification of vessels to be encountered, the location and aspect of the encounter, and any other information pertinent to navigational safety such as channel obstruction and navigational aids not operating. In this mode, the role of the VTS is limited to the dissemination of information to the vessels.

In an advising/directing mode, the VTS functions to detect possible conflict situations in advance and to alert vessels to these possible conflicts. This mode requires that the VTS carefully define the criteria for conflicts and continually analyze traffic flow to detect problems as far in advance as possible. A prerequisite to this mode of operation is adequate surveillance of the VTS area through radar, television or other sensors to provide accurate vessel position information and to detect conflicts such as congestion, lane stray, groundings and collisions. Once a conflict situation is detected, the involved vessels will be alerted to the problem. This alert may take the form of either an advisory or a direction depending on the nature and severity of the conflict and the capability of the VTS. Solutions to various types of conflicts can be achieved through speed changes, course changes or through alternative routing. In this mode all traffic continues to move until potential conflicts are detected. The VTS's traffic management involvement is limited to resolving these conflicts. If the number or severity of conflicts increases to the point that this mode of operation is overburdened, the VTS may employ a more active mode of traffic management.

In the routing mode of operation, the VTS attempts to provide conflict free traffic flow by controlling entry times and speeds. In order that the VTS may operate in this mode, the VTS must maintain complete and accurate information about the position, speed of advance, intended tracks of vessels

within the system as well as the expected times and points vessels intend to enter the system. It will be necessary to interpret traffic behavior in the context of its total effect on the VTS area as local changes in traffic can cause hazards to the flow of traffic elsewhere in the system. A computer will be a necessary asset to process this vast amount of traffic information in a timely manner and to provide accurate and current information.

Under the authority of the same Ports and Waterways Safety Act, the Coast Guard published a rulemaking in the Federal Register requiring a minimum suit of navigational equipment aboard all commercial U.S. flag vessels and foreign commercial vessels within the navigable waters of the United States. This regulation requires:

- a. Marine radar.
- b. Magnetic steering compass.
- c. Current magnetic compass deviation table or graph.
- d. Gyrocompass or repeater at the main steering stand.
- e. Rudder angle indicator.
- f. Maneuvering information sheet posted prominently.
- g. An echo sounding device.
- h. Continuously recording depth reading device.
- i. Equipment on the bridge for plotting relative motion.

Although the authority to require this equipment existed when the Ports and Waterways Safety Act was enacted in

1972, the Coast Guard did not immediately press for this regulation probably because of their reluctance to take unilateral action before an international agreement could be realized. However, in December of 1976, the tanker ARGO MERCHANT grounded on Georges Banks and spilled about 27,000 tons of oil on one of the richest fishing grounds in the world. When the cause was determined to be linked to poor navigation equipment, the Coast Guard proceeded to unilaterally require the navigation equipment listed on page 7 and the regulation became effective on 1 June 1977.

The Congress made another initiative to improve maritime safety in August 1971 by enacting the "Vessel Bridge-to-Bridge Radio Telephone Act." This statute requires certain vessels navigating upon specified waters of the United States to have VHF radiotelephone capability, and requires the guarding of designated frequencies. The concept is that mariners have a system in addition to the rules of the road and the regulations to prevent collisions at sea with which they can determine how two vessels can safely pass or how any ambiguity in the intentions of the vessels can be clarified.

The effectiveness of the bridge to bridge communications system for avoiding collisions has been demonstrated on both the Great Lakes and the Delaware River. The pilots on the Delaware River have used radiotelephones for nearly 20 years. During the six years prior to its common use, there was an average of about 15 collisions per year. Five years after the



introduction of the radiotelephone, the rate had dropped to an average of 11 collisions per year.

In 1966 and 1967 there was an average of less than four collisions per year. Similar impressive results have been achieved on the Great Lakes where radiotelephone has been used in conjunction with traffic separation lanes.

Development of Vessel Traffic Systems dates back to 1948 when the first system was established in Liverpool, England. In 1949, the first system in the United States was established in Long Beach, California by the Port of Long Beach Authority. This system is advisory in nature and participation in the system is excellent even though it is voluntary.

The development of VTS's in the United States has generally been based on improved marine safety whereas the development in foreign countries has generally been based on a optimization of port facilities through increased traffic.

The concept of foreign VTS's is to maximize the use of docks, coordinate pilotage in and out of ports and promote the maximum throughput of vessel traffic through careful control of vessel movements. This economic approach differs from the more narrowly defined approach of enhanced vessel traffic safety common in the United States.

The U.S. Coast Guard has been experimenting with various electronic navigation and surveillance equipment since the early 1960's to evaluate various concepts by which vessel traffic safety could be enhanced. Various equipment

configurations have included shore-based radar, closed circuit television (CCTV), very high frequency-frequency modulated (VHF-FM) radio, broadcast television and computer assisted terminals.

In 1962, the Coast Guard completed the first experimental Radar and Television Aid to Navigation (RATAN) in New York Harbor. The system used a shore-based radar to scan the harbor approaches and television to broadcast real-time radar information to vessels underway in the area. The mariner could observe this information directly on a commercial television set, and could identify himself on the television by executing a turn maneuver and observing the radar targets on his set. The high persistence of the radar targets created "tails" which permitted the mariner to observe movement history. The system was terminated due to technical problems associated with the television broadcast.

In 1968, the Coast Guard established a Harbor Advisory Radar (HAR) system in San Francisco to determine the basic requirements to effectively monitor and advise vessel traffic in a complex harbor. The installation consisted of standard marine X-band radars on two sites to cover the harbor and sea approaches. After the initial determination of requirements, VHF-FM equipment was added to cover the harbor and the system was changed to an operational VTS in 1972.

In 1973, the Coast Guard conducted a study of 22 major ports in the United States and found that New York, New Orleans

and Houston-Galveston were the three ports which most needed improved vessel traffic services. It also identified the Gulf Intracoastal Waterway from New Orleans to Galveston as the most hazardous waterway in the United States. Other areas identified for potential vessel traffic services were Chesapeake Bay (including both Hampton Roads and Baltimore), the Port of Chicago, and the Delaware River and Bay. To date, six ports have or are scheduled to receive VTS; New York, New Orleans, Houston-Galveston, San Francisco, Seattle and Valdez.

In the next chapter, the procedure for performing a cost-benefit analysis of a Vessel Traffic System will be examined. Cost-benefit analysis is the key element in any request for government funds. The success or failure of a request for funding usually depends directly on the validity of this cost-benefit analysis and the expected return for each dollar spent.

## CHAPTER II

### COST BENEFIT ANALYSIS

With all the pressure on the government to hold down federal spending and to balance the budget, it is imperative that any new program be able to demonstrate a substantial return for each federal dollar spent. Vessel traffic management is such a new program and, perhaps, is subject to even closer scrutiny than other well established federal programs since it must compete with these established programs for funding. It is, therefore, extremely important that the benefits derived from a vessel traffic management system be identified and a dollar value determined.

The approach taken by the Coast Guard has been to base its evaluation of the benefits derived by VTS on enhanced marine safety and environmental protection. The Ports and Waterways Safety Act of 1972 clearly specifies these benefits in the Statement of Policy that:

The Congress finds and declares --

(a) that navigation and vessel safety and protection of the marine environment are matters of major national importance;

(b) that increased vessel traffic in the Nation's ports and waterways creates substantial hazard to life, property, and the marine environment;

(c) that increased supervision of vessel and port operations is necessary in order to --

(1) reduce the possibility of vessel or cargo loss, or damage to life, property, or the marine environment;

(2) prevent damage to structures in, on or immediately adjacent to the navigable waters of the United States or the resources within such waters;

(3) insure that vessels operating in the navigable waters of the United States shall comply with all applicable standards and requirements for vessel construction, equipment, manning, and operational procedures; and

(4) insure that the handling of dangerous articles and substances on the structures in, on, or immediately adjacent to the navigable waters of the United States is conducted in accordance with established standards and requirements; and

(d) that advance planning is critical in determining proper and adequate protective measures for the Nation's ports and waterways and the marine environment, with continuing consultation with other Federal agencies, States representatives, affected users, and the general public, in the development and implementation of such measures.

In 1973, the Coast Guard conducted a study of 22 of the major ports and waterways in the United States in order to identify which of these ports or waterways, if any, could benefit from the installation of a Vessel Traffic Service. Since the European systems already in operation were established to improve the efficiency of traffic flow rather than improve safety and environmental protection, there were no cost-benefit analysis techniques developed to evaluate the benefits realized.

For our analysis, the Coast Guard chose to evaluate several traffic management measures in an ordered progression of increasing complexity and increasing cost. To determine the effectiveness of each measure, a case by case examination of vessel accident reports from FY69-72 was conducted to ascertain if that particular VTS measure was capable of preventing that accident. In many cases the accident reports provided very limited information and the researchers had to

make some subjective judgments as to which accidents were preventable by the measure being examined.

The minimum level of vessel traffic management considered was Vessel Bridge-to-Bridge Radiotelephone. Those accidents judged preventable by Vessel Bridge-to-Bridge Radiotelephone included "most vessel collisions in waters where maneuvering room was available, and in which at least one of the vessels had prior knowledge of the other's presence. . . ." <sup>1</sup> Accidents occurring when vessels in the main stream collided with vessels backing out of slips or entering the main stream, and when vessels collided while rounding blind bends, although previously governed by rules of the road and often influenced by local communications practices, were also considered preventable by this level. 33 CFR 26, Section 26.04(b) states "Each person who is required to maintain a listening watch under Section 5 of the Act shall, when necessary, transmit and confirm, on the designated frequency, the intentions of his vessel and any other information necessary for the safe navigation of vessels."

The second level of vessel traffic management examined was the use of regulations. At the beginning of the study, regulations governing the conduct of vessels were considered, but were not itemized as it was felt they would be included in each VTS level. As the study progressed it became apparent that regulations not necessarily associated with a level of VTS could be useful in reducing vessel accidents. Regulations

were considered on a port by port basis when the need was identified in the review of casualty information. Based on data available in casualty reports and charted information, bridge rammings caused by excessive tow length or underpowered tugs or towboats were considered preventable by implementation of regulations establishing a relationship between towboat characteristics and size of tow. Additionally bridge rammings caused by lack of communications or coordination with bridge tenders were considered preventable by implementation of regulations requiring bridge tenders to maintain a radio guard on the Bridge-to-Bridge Radiotelephone frequency and for vessels to make timely radio contact with the bridge tender to insure safe passage of the bridge draw.

The third level of vessel traffic management considered was the institution of Traffic Separation Schemes (TSS). The TSS is a passive system component which does not require a shore-based, manned control center and is relatively inexpensive. A series of buoys form traffic lanes which divide opposing streams of traffic. Certain categories of vessels would be required to navigate within the lanes. Most vessel collisions that occurred in waters amenable to traffic separation and areas having diverse traffic patterns and low to medium traffic density were considered preventable by this level.

The fourth level of vessel traffic management examined was the use of a Vessel Movement Reporting System (VMRS). A

VHF-FM communications network allows vessel operators to communicate with a shore-based, manned center. Certain classes of vessels are required to relay navigational information to the shore station operators who plot the vessels' movement through the port or waterway. The Vessel Traffic Center can advise vessels of other traffic in their vicinity and alert vessels before critical encounters occur. Also included in this level were regulations tailored to fit the needs of each port or waterway. Examples of these are as follows:

- o Vessels may be required to give advance notice of entering and leaving the system and may be required to report their position at checkpoints in the port or waterway.

- o Measures for priority movements of dangerous cargo.

- o Measures for coordination of draw bridges, barge fleeting areas and other critical areas.

Accidents were considered to be preventable by level L2 if any of the following criteria were met:

- o Accidents occurring as a result of two vessels meeting in especially critical and crowded restricted waters without advance knowledge of each other.

- o Accidents caused by apparent lack of traffic coordination where advance knowledge of movements will allow for queuing.



o Accidents caused by the lack of coordination between draw bridge operators and vessels, vessels in vicinity of barge fleeting areas, and vessels in other critical areas.

o Accidents involving dangerous or hazardous material where priority movements might be considered.

The next level of VTS considered was basic surveillance. This included surveillance with an inexpensive "off-the-shelf" radar. The basic surveillance mode does not include sufficient features for positive control, but does considerably improve the shore-based center's knowledge of the presence and movement of vessels in the area.<sup>2</sup>

In a case by case study, it was difficult to determine whether surveillance would have been necessary to prevent any particular accident. Rather basic surveillance would have improved effectiveness of the less sophisticated levels. For this reason, all preventable accidents were plotted on navigational charts to get an overview of each port area. In many areas, the accident potential was so great that only a minimal potential for error could be tolerated. Therefore, it was assumed that many accidents in critical intersections and bends, especially in restricted waters, would be preventable only by surveillance where some sort of active management of channel entrance and exit, anchoring, and separation would be employed. In this analysis, collisions between an underway vessel and a moored or anchored vessel were considered preventable by this level.

Collision avoidance radar and computer interfaced components comprised the final level of VTS dealt with in this study. These sophisticated system elements provide the highest degree of reliability in port management and maximum capability to control movements. Again, it was difficult to determine whether this level would be required to prevent any particular casualty. It was evident, from plotting accidents on charts and from reviewing transit data, that some port areas were extremely congested and dangerous. Collision avoidance radar and computer-interfaced equipment was considered to be necessary to prevent many of the casualties which occurred in relatively open waters where traffic density was high, and traffic patterns diverse and complicated. Also a computerized queuing system would reduce congestion and minimize delays.

Accidents which were judged not preventable by the previous levels of VTS were categorized as "unpreventable." This group included collisions, rammings and groundings caused by many different factors. Some of the accidents judged unpreventable by VTS are as follows:

1. Collisions, rammings and groundings directly due to mechanical failures on board the vessel.
2. Ramming piers while docking and undocking.
3. Groundings of barges reportedly due to broken tow lines.
4. Groundings reportedly due to channel silting.
5. Ramming uncharted submerged objects.

6. Groundings and bridge rammings reportedly due to maneuverability problems (wind/current).
7. Collisions with pleasure craft when pleasure craft were at fault.
8. Ramming aids to navigation reportedly due to maneuverability problems (wind/current).<sup>3</sup>

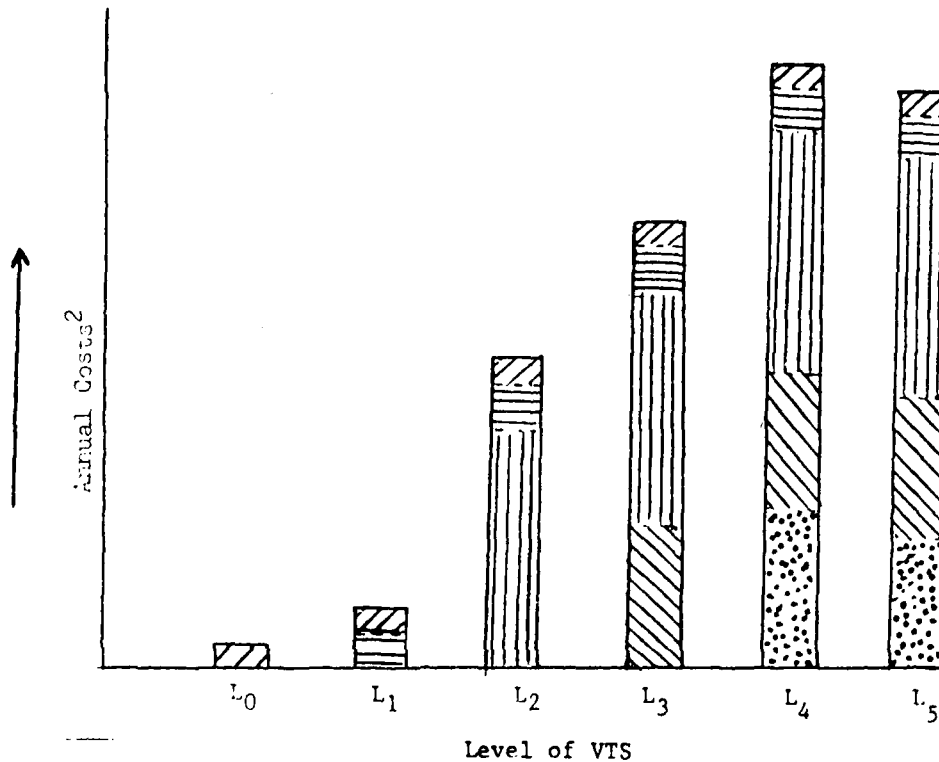
Figure 1 presents the General Trend of Annual Costs versus the VTS level employed. As one might expect, the costs rise measurably with each increase in the level of VTS employed.

Figure 2 presents the Estimated Reduction in Vessels in Accidents by VTS Level. Again, as expected, the percent of reduction in accidents increases as higher levels of VTS are employed.

FIGURE 1

General Trend of Annual Costs  
Versus  
VTS Level<sup>1</sup>

Graph assumes hypothetical VTS in which all VTS levels can be used.



<sup>1</sup>Definition of Levels and Legend of costs

L <sub>0</sub> - Vessel Bridge to Bridge Radiotelephone . . .	
L <sub>1</sub> - Traffic Separation Scheme . . . . .	
L <sub>2</sub> - Vessel Movement Reporting System . . . . .	
L <sub>3</sub> - Basic Surveillance . . . . .	
L <sub>4</sub> - Advanced Surveillance. . . . .	
L <sub>5</sub> - Automated Advanced Surveillance. . . . .	

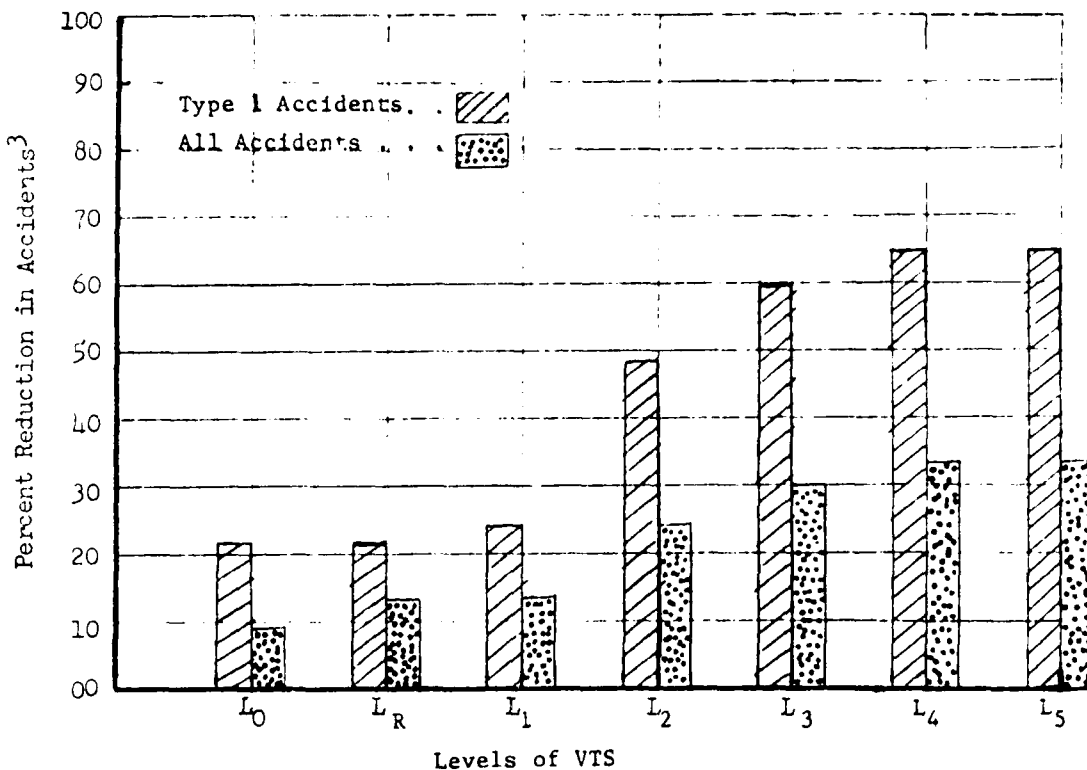
<sup>2</sup>Annual cost is defined as the construction cost amortized over twenty years plus the annual operating costs. Costs are based on actual costs for Puget Sound (Phase I) and San Francisco, and on estimated costs for Houston/Galveston and New Orleans (Phase I).

Source: U.S. Coast Guard, Vessel Traffic Systems Analysis of Port Needs (Washington, 1973), p. 29.

FIGURE 2

Estimated Reduction in Vessels in Accident by VTS Level<sup>1</sup>  
(Cumulative)

Based on FY 1969-72 data for 22  
Ports and Waterways<sup>2</sup>



<sup>1</sup>Definition of Levels:

- L<sub>0</sub> - Bridge to Bridge Radiotelephone
- L<sub>R</sub> - Regulations
- L<sub>1</sub> - Traffic Separation Scheme
- L<sub>2</sub> - Vessel Movement Reporting System
- L<sub>3</sub> - Basic Surveillance
- L<sub>4</sub> - Advanced Surveillance
- L<sub>5</sub> - Automated Advanced Surveillance

<sup>2</sup>Area included: New York, New Orleans, Houston, ICW 80-99, ICW 107-129, Chesapeake Bay, Sabine Neches, Baton Rouge, ICW 50-69, Delaware Bay, ICW 155-179, San Francisco, Tampa, Chicago, Puget Sound, LA/LB, Long Island Sound, Detroit River, Mobile, Corpus Christi, St. Louis, and Boston. (ICW represents Intracoastal Waterway between New Orleans and Galveston.)

<sup>3</sup>Total number of vessels involved in Type 1 accidents: 1344. Total number of vessels involved in all accidents: 3921. The percent reduction in accidents is computed using the total number of vessels in accident. An accident is defined as any collision, ramming, or grounding incident.

<sup>4</sup>Type 1 accident is a collision between two or more vessels in meeting, crossing, or overtaking situations.

Source: U.S. Coast Guard, Vessel Traffic Systems Analysis of Port Needs (Washington, 1973), p. 30.

The result of this study was an estimate of the accidents which could have been prevented by each level of vessel traffic management for each of the 22 ports and waterways examined. Table I presents this data in terms of Annual Estimated and Damage and \$ Reduction by Bridge-to-Bridge and by VTS.

Table II presents the data on those accidents which involved pollution and depicts the Annual Estimated Pollution Incidents and Pollution Reduction by Bridge-to-Bridge and by VTS. These data represent an additional source of economic justification for a VTS based on the avoidance of pollution incidents and their associated costs.

Table III presents the Annual Estimated Deaths/Injuries and Death/Injury Reduction by Bridge-to-Bridge and by VTS. It is Coast Guard policy not to assign a dollar value to a human life saved, however, the absolute number of deaths or injuries prevented should be estimated and included in the analysis for a given level of VTS.

Table IV is a Combined Summary; Composite Ranking of Ports and Waterways and Initial VTS Level Selections. This table represents the summation of all benefits accrued to a VTS Level and represents one-half of the cost-benefit equation.

A more detailed example of the calculation performed to determine the casualty loss reduction for the port of New Orleans is included in Appendix A.

TABLE I

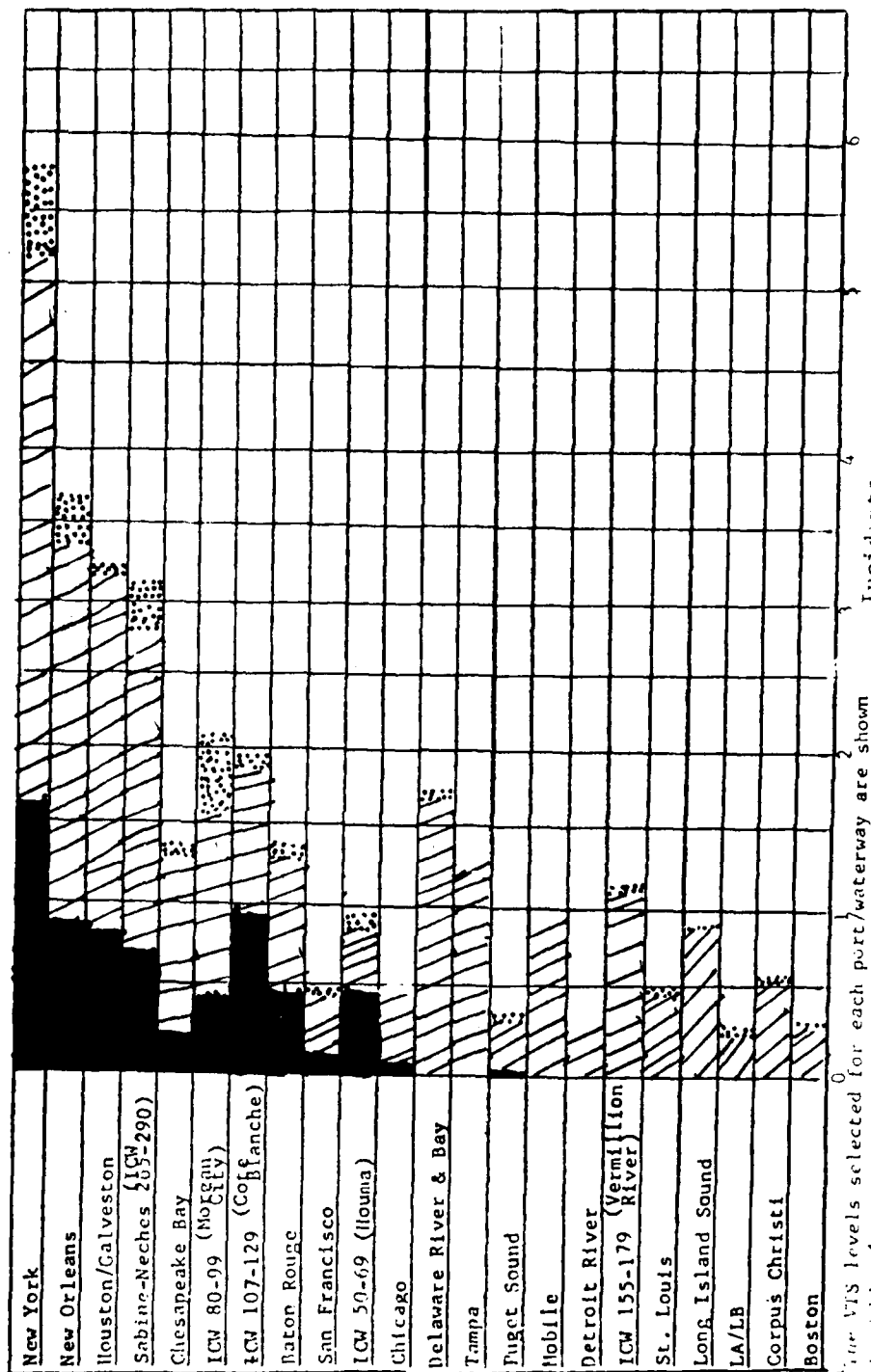
New York	
New Orleans	
Houston/Galveston	
Sabine-Neches (ICW 203-290)	
Chesapeake Bay	
ICW 80-99 (Mobile)	
ICW 107-129 (Coffe. Blanche)	
Baton Rouge	
San Francisco	
ICW 50-69 (Houma)	
Chicago	
Delaware River & Bay	
Tampa	
Puget Sound	
Mobile	
Detroit River	
ICW 153-179 (Vermillion River)	
St. Louis	
Long Island Sound	
LA/LB	
Corpus Christi	
Boston	

The VTS levels selected for each port/waterway are shown in Table 4.

Legend: Est. Annual \$ reductions of B to B; Est. Annual \$ reductions of VTS In Millions

Residual annual \$ damages (An absence of indicates no VTS level above L0 recommenced)

TABLE II  
Annual Estimated Pollution Incidents  
and Pollution Reduction by  
B to B and by VTS

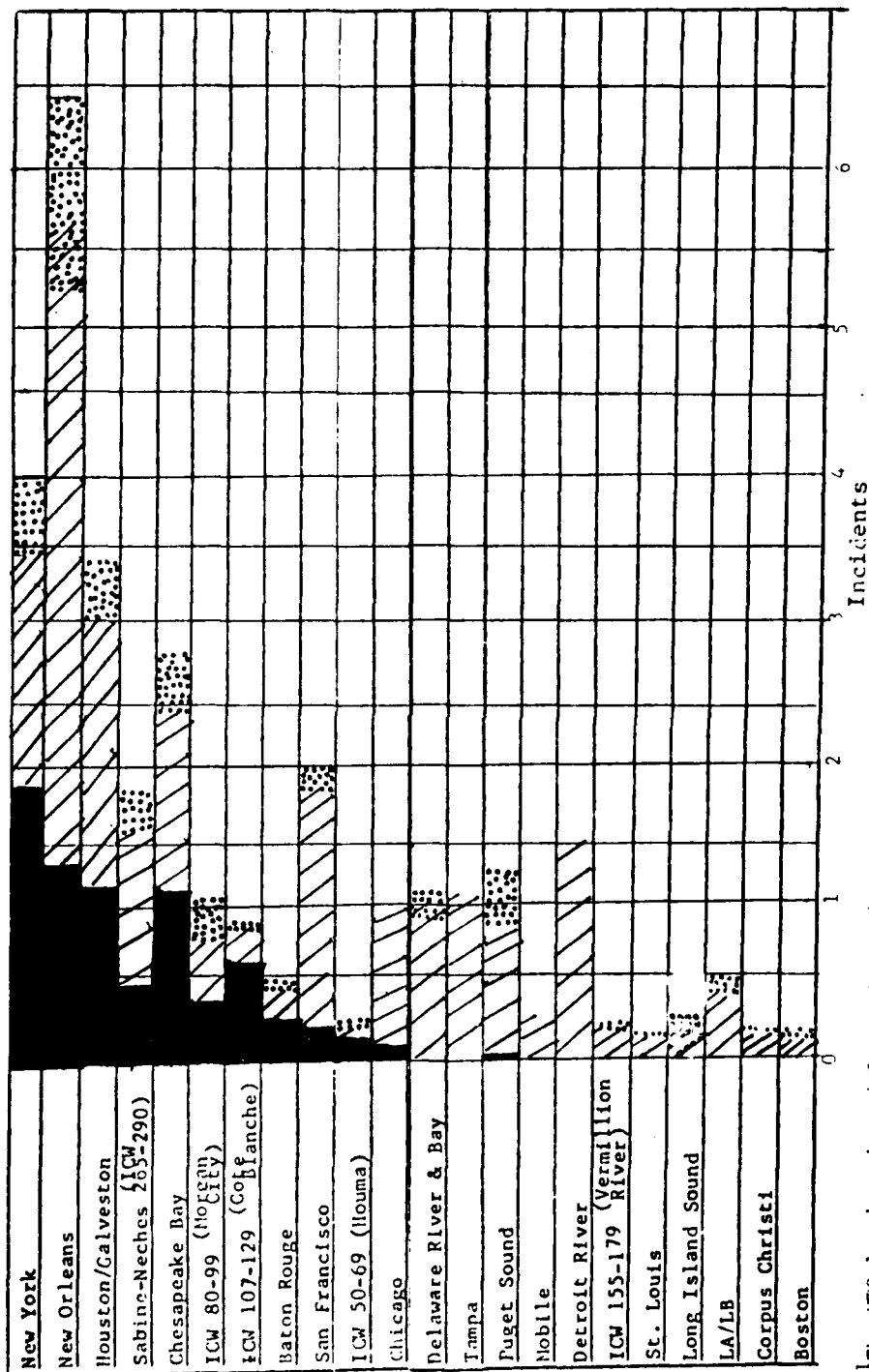


For VTS levels selected for each port/waterway are shown in Table 4.  
Legend: ■ Est. Annual pollution reductions of B to B; ▨ Est. Annual pollution reductions of VTS  
● Residual annual pollution damages (An absence of ▨ indicates no VTS level above L0 recommended)



TABLE III

Annual Estimated Deaths/Injuries  
and Death/Injury Reduction  
by B to B and by VTS



The VTS levels selected for each port/waterway are shown in Table 4

Legend:

Est. Annual death/injury reductions of B to B

Residual annual death/injury

Est. Annual death/injury reductions of VTS

(An absence of indicates no VTS level above L0 recommended)

TABLE IV  
Combined Summary: Composite Ranking of Ports and Waterways and Initial  
VTS Level Selections

Port or Waterway	Relative Ranking of Estimated Annual Damages Caused by C/R/G				VTS Level Selections <sup>1</sup>	Relative Ranking of Estimated Annual Reductions due to VTS				Composite Ranking Total
	Dollars	Pollution	Injuries	Deaths		Dollars	Pollution	Injuries	Deaths	
New York	1	1	2		L <sub>0</sub> 2L <sub>2</sub> 2L <sub>3</sub>	1	1	1		7
New Orleans	2	2	1		2L <sub>2</sub> L <sub>3</sub>	2	3	2		12
Houston/Galveston	3	3	3		L <sub>2</sub> L <sub>3</sub>	4	4	3		20
Sabine-Neches (ICW 265-290)	4	4	6		L <sub>0</sub> 2L <sub>2</sub>	6	5	6		31
Chesapeake Bay	5	8	4		L <sub>0</sub> L <sub>2</sub> L <sub>3</sub>	9	9	4		39
ICW 80-99 (Morgan City)	9	5	10		L <sub>R</sub> L <sub>2</sub>	3	8	7		42
ICW 107-129 (Coffmanche)	13	6	12		L <sub>4</sub>	5	2	5		43
Baton Rouge	11	9	14		L <sub>2</sub>	7	7	9		57
San Francisco	8	17	5		L <sub>2</sub> L <sub>5</sub>	11	10	8		59
ICW 50-69 (Houma)	18	12	15		L <sub>2</sub>	8	6	10		69
Chicago	10	18	13		L <sub>R</sub>	10	11	11		73
Delaware River & Bay	7	7	9		L <sub>0</sub>	17.5	17.5	17.5		75.5
Tampa	6	10	11		L <sub>0</sub>	17.5	17.5	17.5		79.5
Puget Sound	16	20	8		L <sub>2</sub>	12	12	12		80
Mobile	12	13	17		L <sub>0</sub>	17.5	17.5	17.5		94.5
Detroit River	14	22	7		L <sub>0</sub>	17.5	17.5	17.5		95.5
ICW 155-179 (Vermillion River)	19	11	18		L <sub>0</sub>	17.5	17.5	17.5		100.5
St. Louis	15	16	21		L <sub>0</sub>	17.5	17.5	17.5		104.5
Long Island Sound	20	14	19		L <sub>0</sub>	17.5	17.5	17.5		105.5
LA/LB	17	21	16		L <sub>0</sub>	17.5	17.5	17.5		106.5
Corpus Christi	21	15	20		L <sub>0</sub>	17.5	17.5	17.5		108.5
Boston	22	19	22		L <sub>0</sub>	17.5	17.5	17.5		115.5

<sup>1</sup> See page 22 for explanation of notation

Source: U.S. Coast Guard, Vessel Traffic System Analysis of Port Needs (Washington, 1973), p. 33, 34.

These calculations were an important consideration when the Coast Guard performed the cost-benefit analysis required by the Coast Guard Planning and Programming Manual (COMDTINST M16010.1) in order to prepare the Resource Change Proposals to actually fund the construction of VTS.

In 1974, the program manager for Vessel Traffic Systems prepared a Resource Change Proposal for the implementation of a VTS from Baton Rouge, Louisiana to the Gulf of Mexico (see Appendix B). The preferred alternative system designed to accomplish the task of vessel traffic management in this area was estimated to cost \$1,700,000 in the first year and a total of \$8,266,000 over the first five years of operation and development.

Included on the cost side of the analysis were the costs of acquisition of the necessary equipment, construction of the operating facilities, operating expenses and personnel costs. The benefit side of the analysis included the expected reduction of collisions by 60% in the initial operating phase and a further reduction to 90% of collisions when phase two was implemented.

Phase one of the plan called for the construction of a traffic control center, seven remote communications sites linked to the control center by microwave equipment and additional Aids to Navigation. In the second year, nine officers and twenty-five enlisted personnel were to be assigned to begin operating the system. In year three, the second

phase of operation would be implemented with the addition of three closed circuit television sites to provide surveillance of the river, radar to provide additional surveillance and addition of a computer to keep track of all the vessels moving through the VTS area.

There were no calculations included in the resource change proposal to estimate the dollar value of the collisions avoided. The estimates of 60% reduction in collisions to be achieved in phase one and 90% reduction of collisions in phase two were not explained or justified even though they substantially exceeded the 19% reduction estimate made in the earlier study.

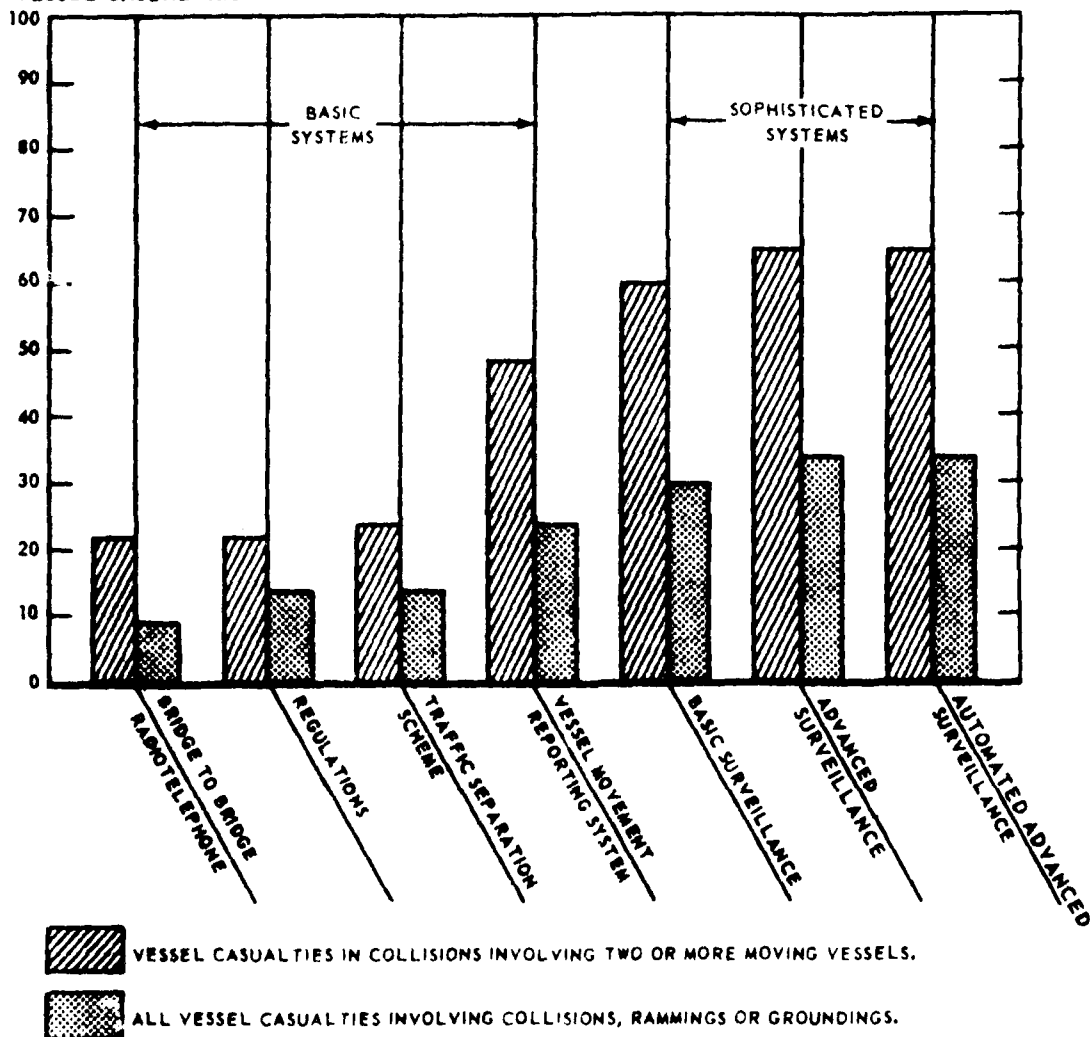
In January 1975, the General Accounting Office (GAO) reviewed the Coast Guard's progress on Vessel Traffic Systems under the authority of the Budget Accounting Act of 1921 (31 U.S.C. 53) and the Accounting and Auditing Act of 1950 (31 U.S.C. 67). GAO concluded that before the Coast Guard added sophisticated elements to their Vessel Traffic Systems such as surveillance radar and television, basic systems should be developed in additional ports and waterways where it would be more cost effective to prevent vessel casualties.

It was the GAO's perception that the seven discrete levels of vessel traffic management identified in the 1973 Coast Guard Issue Study were in fact separable into two groups; basic systems and sophisticated systems (see Figure 3). The basic systems included the levels from Bridge-to-Bridge

FIGURE 3

**ESTIMATED REDUCTION IN ACCIDENTS BY USING  
VARIOUS VESSEL TRAFFIC SYSTEM COMPONENTS  
(CUMULATIVE)**

PERCENT REDUCTION IN  
VESSEL CASUALTIES



Source: General Accounting Office, Comptroller General of the U.S., Vessel Traffic Systems -- What is Needed to Prevent and Reduce Vessel Accidents (Washington, 1975), p. 6.

Radiotelephone through Vessel Movement Reporting Systems.  
The sophisticated systems were those systems which included surveillance.

The GAO audit report continued:

Coast Guard officials told us that relatively simple vessel traffic systems would meet the basic needs of most ports and waterways. In a 1971 position paper, "Vessel Traffic Services and Systems," the Coast Guard stated that its policy was:

\* \* \* to select the minimum level of services and systems required in each port or area to minimize the hazards to vessels, fixed objects, and the environment with the least public cost, disruptions of marine traffic, and economic impact.

Available studies and recent Coast Guard experience indicate that a basic system -- with regulations, a traffic separation scheme, and a vessel movement reporting system -- is expected to:

- Prevent vessel casualties resulting from collisions by about 50 percent.
- Cost about \$1 million or less for each port or waterway to develop.
- Take about 1 to 2 years to become operational.
- Provide a relatively complete data base on vessel traffic.

On the other hand, the addition of radar and other electronic surveillance should:

- Prevent vessel casualties caused by collisions by an additional 10 to 15 percent.
- Cost an additional \$1 to \$9 million to develop in each port or waterway.
- Take 2 to 4 years to become operational.

An example of the trade-offs between a basic system versus the addition of electronic surveillance is apparent in Houston-Galveston. This system is expected to be partially operational in February 1975. It will include a vessel movement reporting system, a complete communication network, television surveillance, and radar surveillance. As presently planned, the total system will be completed in 1977 and is expected to cost about \$2 million.

The vessel movement reporting system being developed in this port is expected to:

- Reduce vessel casualties by about 14 annually.
- Reduce property damage by \$456,000 annually.
- Cost about \$600,000.
- Be operational by February 1975.
- Provide data on traffic volume, types of vessels, types of cargos, and vessel destinations.

The addition of television and radar surveillance is expected to:

- Reduce vessel casualties by two and six, respectively, annually.
- Reduce property damage by \$52,000 and \$189,000, respectively, annually.
- Cost about \$340,000 for the television and \$700,000 for the radar.
- Be operational by February 1975 and 1977, respectively.

The expected benefits of preventing 14 vessel casualties annually by installing a movement reporting system in Houston-Galveston seem substantial and cost effective. However, the relative benefits to be derived from sophisticated system elements appear marginal. For example, in November 1972 the Coast Guard's vessel traffic system advisory committee for the Houston-Galveston system informed the Coast Guard that:

\* \* \* the cost of low-light level, closed circuit TV for surveillance is too high for the information received. The TV only reveals the presence of a vessel in the area scanned by the camera; this information should have been developed by radio reports; the TV would only serve to confirm the radio reports.

We estimate that it would be more cost effective to use funds planned for the television and radar surveillance in Houston-Galveston to provide simpler systems at one or more of the following locations:

<u>Port or waterway</u>	<u>Preventable annual vessel casualties</u>	<u>Reduced annual property damage</u>
Intracoastal Waterway, near Houma, Louisiana	10	\$230,000
Intracoastal Waterway, near Cote Blance, Louisiana	10	230,000
Intracoastal Waterway, near Sabine-Neches, Texas and Louisiana	9	244,000
Intracoastal Waterway, near Morgan City, Louisiana	9	191,000
Chesapeake Bay, Maryland and Virginia	6	262,000
Intracoastal Waterway, near Vermillion River, Louisiana	5	100,000
Dealware River and Bay, New Jersey and Pennsylvania	3	144,000

The communication network to support a vessel movement reporting procedure is estimated to cost about \$500,000 at each of these ports. For the Intracoastal Waterway, however, 8th Coast Guard District officials said that one communication network could serve several sections of the waterway,



thereby making a vessel movement reporting system even more cost-effective. The photograph on page 13 of a barge collision in the Intracoastal Waterway illustrates the type of accident that a vessel movement reporting system should prevent.

The radar or television surveillance being developed in Puget Sound, New Orleans, and the East River and Newark Bay in New York is estimated to be more costly and less effective in reducing accidents than developing a simple vessel movement reporting system in sections of the Gulf Intracoastal Waterway, Chesapeake Bay, and Delaware River and Bay.

We discussed with Coast Guard headquarters officials their reasons for implementing a few sophisticated traffic systems instead of implementing more basic systems. They contended that complete traffic systems were needed in these ports and stated that, in some cases, local maritime interests had expressed a preference for sophisticated systems.

We requested the Coast Guard's view in a letter discussing the possible advantages of implementing more basic systems, as well as the need for a phased approach. The Coast Guard Commandant, on June 21, 1974, replied that the present plans stemmed from the "Vessel Traffic Systems Issue Study" and "Analysis of Port Needs" and that, at this time, they represented the Coast Guard's best effort in planning for vessel traffic systems. He stated that these documents, completed in 1973, were the result of 1 year's effort and were submitted to the Department of Transportation for forwarding to the Office of Management and Budget. He said that the Coast Guard still believes in the principle " \* \* \* to select the minimum level of services and systems required in each port or area \* \* \*" and that its plans are subject to continuing internal review and periodic revision.

#### CONCLUSIONS

The funds available to the Coast Guard for developing vessel traffic systems have been limited. Systems have been started in only a few ports, and much of the benefit expected has yet to be realized.

Greater emphasis should be placed on developing basic traffic systems in more ports and waterways than on developing sophisticated systems in a few ports. The development and operation of basic systems would also provide a better data base for adding sophisticated elements to a system. This change in emphasis would, in our opinion, be more cost-effective than the addition of sophisticated elements in a few ports.<sup>4</sup>

The GAO Report concluded with four specific recommendations to the Secretary of Transportation that he should require the Coast Guard to:

1. --redirect its traffic program to emphasize the development of basic vessel traffic systems in U.S. ports and waterways;
2. --defer its present plans for further electronic surveillance in Houston-Galveston, New Orleans, and the East River and Newark Bay in New York until basic systems have been developed and placed in operation in these ports and several other major U.S. ports;
3. --adhere to a strict phased approach by first operating and evaluating the effectiveness of basic systems before adding more sophisticated elements; and
4. --give national emphasis and direction to establishing regulations as authorized by the 1972 Act to control vessel traffic, including more extensive use of speed limits; greater regulation over the movement of vessels carrying dangerous, combustible, and polluting cargos; and limiting the size of tows.<sup>5</sup>

The Coast Guard's statement on the recommendations in the GAO report included some differences of opinion as to the most cost beneficial method of developing VTS in the United States. The statement read as follows:

RECOMMENDATION 1: "--redirect its traffic program to emphasize the development of basic vessel traffic systems in U.S. ports and waterways;"

In the implementation of vessel traffic systems, it has been the policy of the Coast Guard to proceed on the basis of cost/benefit considerations and national needs. Those ports and waterways with the most pressing marine safety needs and the most promising returns on investment receive first attention. In every area where VTS is instituted, the minimum level of VTS required is selected, and the decision is based on an assessment of total costs and benefits.

The 1973 Coast Guard Study Report, "Vessel Traffic Systems--Analysis of Port Needs" provided a firm foundation for initial VTS planning decisions. Included in the outputs of this study was a ranking of major ports and waterways based on their need for VTS, initial recommendations of the VTS levels justified in each area, and estimates of the expected number of accident preventions. In certain instances, the GAO Report has relied exclusively upon the numbers of accident preventions in evaluating Coast Guard VTS implementation decisions, while excluding from their analysis other pertinent factors relating to VTS needs and benefits. These factors are addressed in detail in the discussion in response to the second recommendation.

In the discussion of the Coast Guard's implementation of VTS the GAO Report states that systems "are becoming increasingly sophisticated and costly," and that, "in some cases, local maritime interests had expressed a preference for sophisticated systems." Notwithstanding, present funding levels and plans for system implementation and sophistication are more conservative than early plans when VTS was first introduced. The studies completed in 1973 were undertaken to structure VTS plans, and recommendations for system complexity are very conservative. While the Coast Guard does provide for adequate consultation, comment, and coordination with local marine interests, as specified by the Ports and Waterways Safety Act of 1972, system implementation is being conducted in accordance with the plan based on national needs, implementation criteria and cost/benefit considerations. Local marine interests do express their preference for sophisticated systems and exert pressure on the Coast Guard, but the final configuration of each system is based on the Coast Guard's judgment of what level is required.

While the Coast Guard does consider the addition of surveillance capabilities as planned for certain selected areas more beneficial than communications systems in lesser ports and waterways, GAO's assessment of the benefits to be derived from such lower level systems is fully concurred in. The Intracoastal Waterway (ICW) west of New Orleans has one of the highest probabilities of accident in the nation. The GAO Report is accurate in identifying the large scale of vessel casualty prevention possible with a communications-based VTS, and in selecting the optimal implementation in this area.

The waters of the ICW are very similar and lend themselves to simultaneous treatment through a systems approach. It would be inefficient to address each specific 10 or 20 mile section on a piecemeal basis. At the present time, detailed data collection efforts are underway on the ICW. It is planned that as soon as an effective approach is identified the ICW will be the next area addressed in VTS developments. It is anticipated that a communications system alone will provide adequate safety; however, surveillance may be incorporated in selected areas if the need is clearly demonstrated.

The Coast Guard recognizes the benefits to be derived from establishing relatively simple systems in lesser U.S. ports and waterways. In 1973, a communications system in the vicinity of McAlpine Dam on the Ohio River near Louisville, Kentucky was instituted. This system is placed in operation at those times when the flood stage at the McAlpine Dam exceeds 15 feet, a condition which causes strong outfall currents at the upstream approach to the canal entrance to the locks. During such times, it is hazardous for more than one tow to be in the vicinity of the lock approach at the same time. The VTS coordinates the arrival of the tows at this approach. At the present time, it is a voluntary system based on a VHF-FM communications network. Personnel who man the system intermittently are made available from their regular tasks by the call up of ready-reservists. Other similar systems may be initiated in response to hazardous situations in the future.

The Coast Guard agrees that in many areas relatively low level systems will provide an adequate level of safety at a favorable cost/benefit ratio. However, a distinct need is recognized to address the major port areas now in planning with systems which will provide the reliability and effectiveness demanded by local conditions. In order to provide maximum national benefit for marine safety, it is essential that those areas with the greatest needs and highest returns on investment be addressed first. In making its implementation decisions, the Coast Guard has been considering all relevant variables and examining the incremental costs and benefits involved with each system component implementation. As systems which achieve acceptable levels of safety are completed in the major ports and waterways now under development, those lesser areas identified by GAO will be addressed. It is strongly maintained that within the limited funding constraints, low level systems in lesser areas should not be undertaken at the expense of providing surveillance capabilities in the major port areas as presently planned.

RECOMMENDATION 2: "--defer its present plans for further electronic surveillance in Houston-Galveston, New Orleans, and the East River and Newark Bay in New York until basic systems have been developed and placed in operation in these ports and several other major U.S. ports;"

This recommendation applies the concerns voiced in Recommendation 1 to the specific areas in which Coast Guard VTS planning and implementation are presently underway. The justification for present Coast Guard plans in each of these areas is discussed separately below.

It is true, as the GAO Report points out, that in some cases more numbers of vessel casualties could be prevented with communications systems in lesser areas than with surveillance additions in major areas. However, a simple tabulation of the number of vessel casualties may be misleading since there may be a large variance in the damage caused by an accident. The amount of physical damage and environmental harm resulting from a vessel casualty

is dependent upon several factors including the vessel's overall size and cargo capacity, the capacity of the individual cargo tanks, the ability of the hull to withstand shock without rupturing, and the nature of the cargo.

Typically, the major U.S. ports in which VTS developments are planned or underway are frequented by vessels whose average damage in accident exceeds that of vessels engaged in operations on the inland waterways. This is due in part to the factors enumerated above. Vessels engaged in international commerce calling at major ports are generally larger in overall size and in cargo capacity. Furthermore, the size of the individual cargo tanks is an important variable in determining the threat to public and environment. Although the quantity of cargo carried by a number of barges making up a tow may be the same as that of medium sized ocean going tank vessel, the number of individual chambers in the tow greatly exceeds the number of tanks of the tanker. The risk is quite different for the same cargo. The quantity of cargo released from a simple hull penetration of a barge tank would be less than that of a tanker sustaining the same damage. In fact the quantity of cargo permitted to be contained in a single tank for oil carrying vessels under IMCO standards is of the order of 30,000 cubic meters, a quantity that few tank barges are capable of handling.

Another major consideration is the construction and maintenance of hull and system. Although foreign flag vessels calling in major U.S. ports are built in accordance with internationally recognized classification society standards (the U.S. Coast Guard plays a supervisory role in development of those of the American Bureau of Shipping) ocean going tankers vary considerably in reliability depending on their registry as a result of differences in national marine safety programs. On the other hand, barges carrying combustible or hazardous cargo in U.S. inland waterways must conform to Coast Guard regulations for construction and maintenance stipulated in Subchapter D and Subchapter O to Title 46 CFR, directed specifically at reducing the potential for damage resulting from casualty. These are the most extensive regulations dealing with tank vessels of any nation. The regulations in Subchapter D deal with vessels which carry flammable or combustible

liquids in bulk. The regulations of Subchapter O deal with vessels which carry certain dangerous bulk cargoes - those which have potential hazard beyond and including that of flammability, such as explosives, poisons, corrosive liquids, etc. (See 46 CFR 151.01)

In addition to the factors which govern the amount of physical damage to the vessel resulting from casualty, other variables must be taken into account for a complete evaluation of marine safety. Without a doubt, the cargo moving in the Houston Ship Channel is among the most hazardous in the nation. Likewise, the waters are very restricted, and have an extremely high probability of accident, based on past casualty data. Although a valid methodology has not yet been developed to quantify the potential for disaster, it is evident that vessel casualties in the Houston Ship Channel have a very high potential for catastrophe due to the nature of cargo moved and the proximity of industry handling this cargo and of the civilian population. In that area all the ingredients are present for a vessel casualty to lead to a major disaster.

Surveillance coverage of selected areas in the Houston/Galveston area will add important capabilities to Coast Guard supervision. The principal purpose of the surveillance system is to confirm vessel movement radio reports. Based on experience gained in operation of the St. Marys River system over a period of many years, it has been concluded that masters tend to hedge their movement reports to give them advantage and priority passage at critical points. This is particularly true when strict speed limits are posted. Furthermore, surveillance will detect the presence of any vessels which fail to report by radio, a condition which cannot be tolerated in an area such as the Houston Ship Channel. In the Houston/Galveston VTS the Coast Guard is also installing automated equipment to process the vessel traffic movement information. Such equipment will provide for fast, reliable information retrieval and will reduce overall manning requirements.

In New York Harbor, the GAO Report concurs in the need for surveillance of two areas, but questions the justification for surveillance in

the adjacent East River and Newark Bay sectors, as planned by the Coast Guard. The same considerations present in the Houston/Galveston area also apply to New York VTS development. Furthermore, a consideration of broader scope must be taken into account in addition to the incremental benefits to be derived from surveillance in each particular section. In developing VTS for the various areas of a complex port, such as New York Harbor, the areas cannot be treated independently of each other. A total systems approach is necessary to achieve an effective system. The fact that the return on investment in surveillance is higher in one area has led GAO to the conclusion that surveillance is not justified in other parts of New York Harbor. The large number of intersections and "mixing bowls" with opposing streams of traffic demand a high degree of reliability and coordination. Therefore, the plan developed for VTS applications in a complex port must provide suitable capabilities to support both a feasible and functional system concept for the port. In addition to defining the concept of operation for the system the plan must also consider the overall operational and regulatory aspects applicable to the port.

For instance, the elimination of surveillance capabilities in the Upper and Lower Bay area would have a far-reaching and detrimental effect on the entire system, especially on the New York and New Jersey Channels. The Constable Hook area, where Kill van Kull intersects Upper Bay, is of this situation. Without totally accurate and complete information concerning vessel movements in Upper Bay, available only through surveillance due to the occasional unreliability of VMRS reports, the effectiveness of surveillance in Kill van Kull would be significantly eroded. Surprise meeting situations would continue to occur in that area due to vessels entering from Upper Bay which had not, or had incorrectly, reported to the VTS, and the potential for serious casualty would remain.

This consideration applies to each of the areas where selected surveillance coverage is planned. It should be noted that the surveillance planned for Newark Bay and the East River will not initially be designed to provide complete coverage. At the outset, surveillance coverage of both of these areas will be provided relatively inexpensively with a total of only three or four remote LLLTV sites.



In New Orleans, as in New York, the potential for catastrophe cannot be discounted, as vessel density is high and millions of people are within close range of the affected waters. Considering all factors, the surveillance planned for selected areas of the Mississippi River in the vicinity of New Orleans is entirely justified. It will replace the personnel required to man the traffic lights operated by the Corps of Engineers and will provide significant benefits in vessel casualty, deaths/injuries, and pollution incident reductions as well as in vessel, cargo, and property savings.

In summary, the GAO Report is accurate in pointing out that in some cases more numbers of vessel casualties could be prevented with communications systems in lesser areas than with surveillance additions in the major areas. However, when all the factors are taken into account, including differences in vessel construction, cargo, traffic density, and the potential for catastrophic environmental and personnel casualty, it is concluded that the surveillance capabilities planned will be the most cost beneficial.

RECOMMENDATION 3: "--adhere to a strict phased approach by first operating and evaluating the effectiveness of basic systems before adding more sophisticated elements;"

The GAO Report correctly states the Coast Guard's policy as set forth in a 1973 Study Report, as follows:

A phased approach will be stressed in the implementation of VTS (vessel traffic systems) in each port or waterway. This procedure will permit experience gained while operating the existing system to be used in planning for a more sophisticated system. It will also provide means to accumulate a better data base.

The GAO Report justifiably calls attention to the apparent inconsistency between that statement and the Coast Guard's plans to establish initially major systems incorporating surveillance and limited automated capabilities. The cause of this discrepancy is the Coast Guard's failure to update

that policy statement to reflect the planning advances which have been made in the interim. Through the development and employment of several analytical tools and techniques, VTS planning has been substantially improved and formalized. In the Coast Guard's Analysis of Port Needs Study completed in late 1973, vessel casualty, transit and damage data were examined in detail for many major U.S. ports and waterways. Estimates of the effectiveness of each VTS level in each of these areas were developed in order to augment the knowledge of VTS requirements and the level of VTS necessary and justified in each area. More refined data collection and analysis techniques are now being employed at particular ports and waterways planned for VTS. Through the use of both side looking airborne radar (SLAR) and a mobile radar and communications van, detailed information is being collected concerning traffic patterns, communications loading, and vessel congestion. Likewise, simulation models have produced good projections of communications frequency and transceiver siting requirements. In addition to these analytical tools, the Coast Guard's knowledge of VTS has been expanded by the experience gained in the operation of two major systems for more than two years, and from planning the major systems in New York, Houston/Galveston, New Orleans and Valdez.

From the detailed analyses conducted in the major ports and waterways under development, the Coast Guard has determined that a higher level of VTS (than the minimum first step) is both required and justified. In such areas, that level of VTS which is considered necessary with a high degree of certainty is being established initially. It should be recognized that even in those areas, the initial implementation may be accomplished in a multi-year approach, but this "phasing" is due to budgetary constraints rather than uncertainty over system needs. The operation of all systems will undergo continuing scrutiny and evaluation. Any modifications or additions which are judged necessary will be undertaken in a subsequent phase(s).

The Coast Guard recognizes the importance of continuing to add to the knowledge base concerning VTS Systems and Operations. Statutory

responsibility to provide vessel traffic systems and services has existed for a very short time -- just over two years, although the legislation was preceded by the establishment of an Advisory Radar System at San Francisco. San Francisco thus became the Field Testing Site for VTS research and development projects. At that location the operational system uses the High Resolution Radars that were developed on an R&D basis. Automated features representative of the more sophisticated VTS levels are maintained there on an experimental basis. Achievement of major hardware advancements, however, does not mean completion of research and development efforts, for much remains to be acquired in the way of operational knowledge before United States Vessel Traffic Systems reach maturity. This is especially evident in the fact that VTS operations have not yet entered into the more complex modes under which vessels are provided movement control by the Coast Guard. Accordingly, developmental emphasis is expected to shift from hardware to operations. Important areas of investigation and definition include the formulation of operational control concepts and the generation of port by port VTS System Functional Requirements based upon traffic analyses, hydrographic data and the (separately derived) operational control concepts. The Department of Transportation recognizes existence of certain parallels along with major differences between Air Traffic Control and Vessel Traffic Control. Without attempting to detail these, it is clear from the aviation experience that there are continuing lessons to be learned in arriving at a national set of Vessel Traffic Systems which operate effectively at lowest system cost. The VTS Research and Development Program in the Coast Guard builds on existing knowledge to help achieve this goal.

RECOMMENDATION 4: "--give national emphasis and direction to establishing regulations as authorized by the 1972 Act to control vessel traffic, including more extensive use of speed limits; greater regulation over the movement of vessels carrying dangerous combustible and polluting cargos; and limiting the size of tows."

The GAO Report stated that the Coast Guard had made limited use of its authority under the Ports and Waterways Safety Act to issue regulations for

the control of vessel movements, and identified control of vessel speed, control of the movement of vessels carrying hazardous or polluting cargoes, and control of tow size as regulatory measures expected to be effective for prevention of accidents. The GAO Report further detailed inconsistencies between headquarters, district and field units in the approach to development of regulations under the Act. The promulgation of regulations was stated to be the measure least costly to the government for reducing accidents through control of vessel movement.

The Coast Guard recognizes the essentiality of these constraints and they are being developed at Headquarters. However, the task of depending meaningful regulatory guidance at the national level is a good deal more profound than may be realized. The Ports and Waterways Safety Act empowers the Coast Guard to regulate the vessel with regard to its route. Such regulations must be merged in a harmonious way with other regulations by which maritime safety in the United States has for years been governed by the Coast Guard. Along with the operational constraints under the Ports and Waterways Safety Act, the pre-existing regulation of safety and construction of the vessel, qualification of crew, safe handling and carriage of cargoes, anchorages, and Rules of the Road form a matrix addressing all elements of the system.

The development of a regulation is an exacting process which requires care in the identification of the problem to be corrected by means of the regulation, recognition of varied geographic and operating conditions, and appreciation of the impact of the regulation on the public affected, including the broad economic effect of the measure, and finally, definition of the corrective regulation. Presumably in recognition of these factors, the Ports and Waterways Safety Act contains a provision for consultation and comment by interested parties in preparation of proposed regulations; this is in addition to the requirements of the Administrative Procedures Act.

Inconsistencies which may appear to exist at the field level could well be due to local efforts to cater for variations in type of vessel, climatic conditions, and waterway configuration. Such local

solutions with their differences will, as feedback, prove beneficial in the preparation of a comprehensive statement from the headquarters level.

The first significant rulemaking under the Act was accomplished in the Puget Sound VTS regulations which became effective on 30 September 1974. These regulations addressed a local problem, identification and solution of which were more readily handled than broad nationwide regulations. Once developed, however, these regulations contained most of the elements which will be employed in other systems, and as such will serve as a model for VTS rulemaking in other areas. Draft regulations now in preparation for San Francisco and Houston VTS draw extensively on the principles worked out for Puget Sound.

Regulations which address navigation and certain vessel operations have been promulgated for Chesapeake Bay; Delaware Bay and Apra Harbor, Guam. Principles employed in these regulations will be applicable to other areas.

Rulemaking actions appeared in the Federal Register on 1 March 1974 and 28 June 1974. Final rulemaking under the first of these actions is now in draft and will be published in the near future. This regulation will enable the District Commander, Captain of the Port, or their authorized representative to direct or control the movements of vessels under emergency or temporarily hazardous conditions when necessary for safety. This is the first regulation of nationwide application under the Ports and Waterways Safety Act. The second action is an advance notification of a broad philosophical approach the Coast Guard intends to follow in regulating the safe movement of vessels by means of operating controls. The work of drafting principles for proposed rulemaking is in progress and addresses equipment required to be on board vessels, tests of machinery and equipment, movement of hazardous and polluting cargoes, and safe operating procedures. The specific principles will be referred to interested parties for consultation in preparing the proposed rules.

The GAO Report places emphasis on control of vessel speed as an effective measure for prevention of accidents. The Ports and Waterways Safety Act gives the Coast Guard authority to control vessel traffic by means of speed limitations in areas

determined to be especially hazardous. The U.S. Army Corps of Engineers presently regulates vessel speed under authority of 33 USC 1. Preliminary arrangements have been made to relieve the Corps of Engineers of this function in all but certain waters of particular interest to the Army. The GAO Report indicated a greater incidence of accidents attributed to excessive vessel speed than Coast Guard analysis of the raw data can support. The Coast Guard is mindful that speed is often listed as a contributing cause to accidents. However, vessel speed alone is rarely the sole cause. The effective regulation of vessel speed is a complex matter related to vessel size and maneuvering characteristics, channel configuration, harbor congestion, weather and visibility, and involves far-reaching economic considerations. The Coast Guard will move forward with repromulgation of the Army Corps of Engineers' regulations where appropriate under authority of the Act, and the development on a case by case basis of regulations to limit vessel speed where necessary in especially hazardous areas.

The GAO Report advised of inconsistency on the part of the Coast Guard in different ports in applying suitable controls to the movement of vessels carrying hazardous or polluting cargoes. Current regulations require advance notification of arrival of any vessel loaded with cargoes of particular hazard. Action taken by the Coast Guard locally upon receipt of that notification will vary according to the particular requirements of different ports, so that some inconsistency is inescapable. The rulemaking, previously discussed for the operational control of vessel movements, will provide the regulatory tools necessary for effective action commensurate to the hazard and the particular area. As an adjunct the Coast Guard is considering an industry proposal to require visual, aerial identification of certain inland barges which carry hazardous or polluting cargoes.

Limitation of tow size and the powering of towing vessels were discussed in the GAO report, in part related to repeated casualties at two bridges. The Coast Guard has eliminated this problem at the West Port Arthur Bridge in Texas by widening the draw under the authority of the Truman Hobbs Act. Since that action, there has been no casualty attributable to the obstructive

nature of the bridge, (or conversely those factors of tow size related to towboat power which could be addressed in regulations). In 1973 and again in 1974 the Coast Guard issued Special Navigation Orders for the protection of the Southern Pacific Railway Bridge at Berwick Bay, Louisiana. These orders, among other things, limited the size of tows permitted to pass through this bridge and established arbitrary horsepower requirements. Work is now in progress to establish a VTS at Berwick Bay for the protection of this bridge. Regulations will be developed for this VTS which will draw on the experience gained with the Special Navigation Orders. Efforts to establish criteria for tow boat power related to the ability to control barges, as called out by the N.T.S.B. report in 1972, have not thus far met with success. The Coast Guard is pursuing solution in two ways: research and development efforts in progress are addressing vessel maneuverability of which power related to tonnage is a significant consideration; and, the problem has been referred to the Towing Industry Advisory Committee to the Marine Safety Council for an empirical solution based on industry practice.

Other measures the GAO discussed which may improve vessel safety are the requirement for drawbridges to be equipped with bridge-to-bridge radio telephone (VHF-FM Channel 13, 156.65 MHz), and the requirement for vessels to have on board some form of precision navigation equipment. The Coast Guard has been generally successful in its efforts to have bridge owners voluntarily equip draw bridges with bridge-to-bridge radiotelephone. Furthermore, in order to address those bridges which have not been so voluntarily equipped, the Coast Guard has sought legislation which would require the bridge owner to install this equipment at the same time bridge protective systems (fendering) are constructed or altered. Loran "C" may prove to be the suitable form of navigation equipment suggested in the report. The Coast Guard has no plans at this time to require Loran "C" to be carried on certain classes of vessels. If the necessary study of this matter should indicate the installation of Loran "C" equipment should be required, regulations towards this end may be developed under the Act.

Recognizing the overall scope of the work of drafting regulations which lies ahead, the Coast Guard is undertaking the development of a comprehensive Ports and Waterways Safety Act regulation plan towards this end. In order to assure a uniform understanding of the basis for the development of these regulations and their equitable enforcement, timely guidance will be circulated to the field.

Several errors and inaccuracies have been found in both the GAO Draft Report and final Report. The Comptroller General was alerted to these discrepancies in Appendix C of the DOT Statement on the GAO Draft Report, which was transmitted on January 21, 1975.

#### IV. STATUS OF CORRECTIVE ACTION

The Coast Guard intends to implement the vessel traffic system program on the basis of cost/benefit considerations and national needs. In keeping with these considerations, and the recommendations of the GAO Report, the next major VTS start is planned for the ICW. Detailed data collection efforts are now underway to identify the marine traffic safety needs more clearly and to help structure a comprehensive approach which will address the entire area most cost effectively. The VTS needs of Chesapeake Bay, an area which the GAO Report recommended for VTS implementation, are presently under study at the local level. By July 1, 1975 the Commander, Fifth Coast Guard District expects this examination along with system recommendations to be complete.

While the Coast Guard's position concerning implementation through a strict phased approach has been previously clarified, analyses of operational effectiveness will be conducted annually for each of the systems. After the selected level(s) has been established and in operation, such analyses will be used to identify the need for possible system upgrading and modification.

For the most part, the GAO Report's Recommendation concerning the promulgation of regulations under the Ports and Waterways Safety Act of 1972 is concurred in. Efforts are underway to identify those aspects of marine safety which lend themselves to universal regulatory treatment.



As such problem areas are identified, nationwide direction to field units will be provided by Coast Guard Headquarters. In other instances, the peculiarity of local conditions will require local regulatory remedies. In any case, greater emphasis is being given to marine safety regulations, and recent headquarters staff augmentation should expedite the entire process.

After the GAO Report and the Statement by the Coast Guard were published, development of "sophisticated" systems continued in Houston-Galveston VTS, New Orleans VTS and New York VTS. The Houston-Galveston VTS became operational in 1975, added television surveillance in 1976, added a computer in 1977 and added radar surveillance in 1978 after the vessel movement reporting system was established. The New Orleans VTS became operational in 1978 with a computer-assisted vessel movement reporting system. No television or radar surveillance has been added to this system. The New York VTS is scheduled to become operational in 1980.

In 1979, the GAO conducted a second review on the progress made in vessel traffic systems. The conclusions drawn after this review were of a similar vein to the conclusions and recommendations of the 1975 study in most respects, but there was a change in some recommendations and a considerable hardening of the GAO position vis-a-vis the Coast Guard's position. In the 1979 study, the GAO held that the United States should not engage in active vessel traffic management (Vessel Movement Reporting Systems and higher levels of vessel traffic management).

This was consistent with GAO's 1975 recommendation to develop many low level (passive) systems before enhancing any systems with surveillance to the sophisticated level, but was inconsistent with their acceptance in 1975 of the budget proposals to build sophisticated systems made by the Coast Guard. The Coast Guard has taken exception to these conclusions and has maintained that in the ports of Houston-Galveston, New Orleans and New York the cost-benefit analysis is favorable for enhancing the systems with radar and television surveillance.

The inherent difficulty with supporting either point of view is that the data base used to prepare both cost-benefit analyses is inadequate, unreliable and incomplete. The problems associated with the collection of vessel accident data will be examined in detail in the next chapter.

## CHAPTER III

### MARINE CASUALTY DATA

Title 46 of the Code of Federal Regulations (CFR) provides the legal basis for the Coast Guard to collect data on marine casualties. Section 4.05-1 of this Title specifies:

The owner, agent, master, or person in charge of a vessel involved in a marine casualty shall give notice as soon as possible to the nearest marine inspection office of the Coast Guard whenever the casualty results in any of the following:

- (a) Actual physical damage to property in excess of \$1,500.00;
- (b) Material damage affecting the seaworthiness or efficiency of a vessel;
- (c) Standing or grounding;
- (d) Loss of life; or
- (e) Injury causing any persons to remain incapacitated for a period in excess of 72 hours; except injury to harbor workers not resulting in death and not resulting from vessel casualty or vessel equipment casualty.

In order to ensure that these required reports are made, the Coast Guard Marine Safety Manual (CG-495) states that if a master fails to report a marine casualty he shall incur a penalty of \$100 and such failure to report may be made the basis for referral of charges against the Master's license. The master, owner or agent of a vessel of the United States, or a barge while in tow through the open sea, is also responsible for reporting marine casualties by the provisions of 33 U.S.C. 361, 362 and 365.

Reports of marine casualties specified in Section 4.05-1 are made on a Report of Vessel Casualty or Accident Form (CG-2692) (see Appendix C). Upon notification of a marine casualty or accident, the Commandant of the Coast Guard or the local District Commander will immediately order an investigation of the accident as set forth in Section 4.07-1 of Title 46 U.S.C.

The primary purpose of this investigation is to ascertain causes and to determine what corrective measures, if any, should be taken to promote safety of life and property at sea. Coast Guard investigations also ascertain if there are any violations of Federal laws or regulations. The Coast Guard is empowered to assess civil penalties, but if there is evidence of a criminal violation, the case is referred to the United States Attorney. The Coast Guard does not investigate marine casualties to fix civil liability between private parties.

Subpart 4.07 continues, however, to say:

(c) The investigation will determine as closely as possible:

- (1) The cause of the accident;
- (2) Whether there is evidence that any failure of material (either physical or design) was involved or contributed to the casualty, so that proper recommendations for the prevention of the recurrence of similar casualties may be made;
- (3) Whether there is evidence that any act of misconduct inattention to duty, negligence or willful violation of the law on the part of any licensed or certificated man contributed to the casualty, so that appropriate proceedings against the license or certificate of such person may be recommended and taken under Title 46, U.S. Code, section 239;

(4) Whether there is evidence that any Coast Guard personnel or any representative or employee of any other government agency or any other person caused or contributed to the cause of the casualty; or,

(5) Whether the accident shall be further investigated by a Marine Board of Investigation in accordance with regulations in Subpart 4.09.

In the course of the investigation, the investigating officer has the power to:

. . . administer oaths, subpoena witnesses, require persons having knowledge of the subject matter of the investigation to answer questionnaires and require the production of relevant books, papers, documents and other records.

Attendance of witnesses or the production of books, papers, documents or any other evidence shall be compelled by a similar process as in the United States District Court.

In major marine casualties when the Commandant of the Coast Guard perceives that a further investigation of the casualty would tend to promote safety of life and property at sea and would be in the public interest, the Commandant will designate a Marine Board of Investigation to conduct such an investigation.

Subpart 4.09-5 specifies the powers of the Marine Board of Investigation as follows:

Any Marine Board of Investigation so designated shall have the power to administer oaths, summon witnesses, require persons having knowledge of the subject matter of the investigation to answer questionnaires, and to require the production of relevant books, papers, documents or any other evidence. Attendance of witnesses or the production of books, papers, documents or any other evidence shall be compelled by a similar process as in the United States District Court. The chairman shall administer all necessary oaths to any witnesses summoned before said Board.

The Marine Board is open to the public except when evidence of a classified nature or affecting national security is to be received. The testimony of witnesses is transcribed and a complete record of the proceedings is kept. At the conclusion of the investigation a written report containing the findings of fact, opinions, and recommendations is submitted to the Commandant for his consideration. All of these records are made available to the public in accordance with 49 C.F.R. Part 7.

Although the avowed purpose of the Vessel Casualty or Accident Form and the Accident Investigation program is to promote safety, the potential for civil penalties and/or actions against master's licenses and criminal proceedings are a powerful deterrent to reporting accidents or to completing accident report forms with total candor.

In a 1973 Study entitled "Vessel Traffic Systems: Analysis of Port Needs" the Coast Guard estimated that casualty reports were filed on only 30% of reportable casualties. However, it is logical to assume that a higher percentage of the more serious accidents were reported since more attention is drawn to casualties involving loss of life, substantial damage to vessels or major oil pollution.

The same 1973 study referred to a comparison made by the Coast Guard in 1971 of the estimated damages on the casualty reports and the actual cost of repairs. This comparison revealed that the estimated damages on the casualty

reports were only about half of the actual damage. In addition, the study alluded that property damage, pollution incidents and injuries were understated as well. In order to compensate for the unreported accidents and these estimated understatements, the vessel and cargo loss values were multiplied by a factor of four before use in the Vessel Traffic System cost-benefit analysis.

In the Coast Guard's publication Statistics of Casualties for FY 1978 (see Table 5), there were 894 vessels involved in casualties reported to the Coast Guard. Of these 894 casualties an unbelievable 586 casualties were caused by a "Fault on part of other vessel or person." This is a graphic example of how the data on commercial vessel casualties is biased and inaccurate.

In order that accurate vessel casualty reports can be obtained, it is necessary to separate the safety investigation from the fault-finding investigation and to protect any information submitted on the Report of Vessel Casualty or Accident Form from any use except maritime safety. Such a system is currently employed by the U.S. Air Force in regard to aircraft accident investigations.

Air Force Regulation 110-14 specifies that an Aircraft Accident Investigation shall be "for the sole purpose of accident prevention." A second Collateral Investigation is conducted "to obtain and preserve all available evidence for use in claims, litigation, disciplinary action, and adverse

TABLE V

## Statistical Summary of Casualties to Commercial Vessels

1 October 1977 to 30 September 1978 Fiscal Year 1978		Collisions, crossing, meeting and overtaking	Collisions while anchored, docking, or undocking	Collisions, fog	Collisions with piers and bridges	Collisions, all others	Explosion and/or fire—cargo	Explosion and/or fire—vessel's fuel	Explosion and/or fire—pressure vessels, boilers	Explosion and/or fire—electrical equipment, all others	Grounding with damage to vessel	Grounding without damage to vessel	Foundering, capsizing, and flooding	Heavy weather damage	Cargo damage	Material failure—structure and equipment	Material failure—machinery and engineering equipment	Casualty not otherwise classified	Total
Number of casualties		309	233	1	618	367	8	11	13	178	628	999	323	3	13	284	370	104	4246
Number of vessels involved		894	688	2	1264	585	11	12	13	193	700	908	631	7	16	349	602	743	7118
Number of unspectored vessels involved		130	184	1	336	174	7	1	12	42	204	357	67	4	14	210	780	64	2111
Number of unspectored vessels involved		644	502	1	888	411	4	11	1	131	492	631	564	3	2	139	504	179	4987
PRIMARY CAUSE																			
Personnel fault:																			
Pilot—State		16	18		30	5					7	31	2			1		4	114
Pilot—Federal		5	2		20	3					7	11						4	48
Licensed officer—Documented seaman		140	118		349	118	1	1	1	3	172	193	63			10	3	23	1202
Unlicensed—Unlicensed persons		76	31		26	42				5	90	93	68			6	3	7	487
All others		16	19		32	12	2			13	12	34	15			2	12	2	190
Unlabeled risk		1	1		1	1					4	1						2	9
Restricted maneuvering room		1	1		2	5					3	3	1					1	17
Storms—adverse weather		6	8		30	22					35	32	94	4	13	100	2	14	360
Unusual currents		1	1		3	1					3	3	8					2	24
Shear, suction, bank cushion		9	1		3	1					3	3						20	20
Depth of water less than expected		2									30	129						164	164
Failure of equipment		19	37		33	2	3	3	9	62	37	37	76			109	548	10	1024
Unseaworthy—lack of maintenance		1	1		1	1				3	1	102	1			17		1	138
Floating debris—submerged object		1			9	74				6	2	21				4	1	2	124
Inadequate tug assistance		1	2		8	2				1	2							16	16
Fault on part of other vessel or person		186	437	1	642	246	3	1	13	277	316	147	2	1	77	33	140	2422	
Unknown—insufficient information		14	12		11	24	2	7	2	93	11	9	74			14	8	18	307
TYPE OF VESSEL																			
Spectored vessels:																			
Passenger and ferry—large		2	4		19	11				2	2	4	2			6	14	1	67
Passenger and ferry—small		22	15		9	22		1		11	24	9	28			10	81	4	242
Freight		34	44		111	79	1		8	12	39	73	9	1	14	107	18	611	
Cargo Barge		3	1		7	3				3	1						2	20	
Tankship		14	34		41	23	1		6	8	19	63	7	2		44	74	3	119
Tank Barge		162	78		163	64	5			6	114	123	19	1		38	12	34	799
Public		8	4		3	1				1	1	1	1				1	11	
Miscellaneous		3	4		3	11				2	4	1	1			6	4	1	42
Unspectored vessels:																			
Fishing		117	80	1	23	70		3		48	127	172	224			44	221	24	1180
Tug/Towing		273	163		471	173	2	1		42	173	263	148	2	1	44	42	31	1811
Foreign		80	100		63	38		1	1	10	34	76	12			13	22	19	449
Other		194	159		329	130	2	4		31	134	140	200	1	1	36	19	103	1327
GROSS TONNAGE																			
100 tons or less		484	441	2	433	331	4	9		140	319	373	307	2	1	110	338	83	3345
Over 100 to 1,000 tons		173	84		392	75	5	2		16	183	203	93			40	20	81	1373
Over 1,000 to 10,000 tons		130	123		231	114	3	1	3	26	140	173	37	2	4	78	44	40	1213
Over 10,000 tons		83	116		146	63	1		10	11	36	157	12	3	11	121	158	37	987
LENGTH																			
Less than 100 feet		409	298		364	233	4	8		130	273	331	460			83	334	68	3017
100 to less than 300 feet		44	243	2	443	227	1	1		43	344	379	147	3	1	100	67	133	2764
300 to less than 500 feet		31	29		48	42	2	1	1	6	21	38	12	1	1	27	23	5	290
500 feet and over		70	116		169	63	2		12	12	60	140	12	3	14	139	176	37	1043
AGE																			
Less than 10 years		462	282	1	546	279	3	4	4	76	303	389	133	2	7	133	273	103	3028
10 to less than 20 years		172	173	1	299	122	1	4	3	37	186	241	170	3	2	88	110	41	1683
20 to less than 30 years		87	96		202	71	3	1	1	28	73	123	123		2	44	77	36	969
30 years and over		173	139		199	113	2	3	3	32	126	153	283	2	3	83	140	63	1438



administrative proceedings, and for all other purposes except for safety and accident prevention purposes."

There is a specific rationale for this dual investigative procedure, and it applies in the area of vessel casualties as well. The Air Force believes that a witness may be reluctant to testify freely before the collateral investigation board for fear that his testimony will reveal some negligence or misconduct on his part, thereby exposing himself to disciplinary action or other adverse consequences.

The Department of the Air Force has successfully defended the privacy of the Aircraft Accident Investigation in the case of *BROCKWAY v. Department of the Air Force* (518 Federal Reporter page 1184). In this case, a request for a copy of the Aircraft Accident Investigation was requested under the provisions of the Freedom of Information Act (5 U.S.C. § 552). The U.S. Court of Appeals, Eighth Circuit found that the statements of witnesses not in the Air Force contained in the Accident Investigation Report fell into a category of an exemption to the Freedom of Information Act and that the Air Force need not release this part of the Aircraft Accident Report. The court found:

On the narrow facts of this case we believe that the deliberative process of the Air Force in establishing appropriate safety policies will be best protected by permitting these witness statements to be exempted from disclosure. If the statements are disclosed and the flow of information to the Air Force safety investigation boards is curtailed, there is the definite possibility that the deliberative process of the Air Force will be hampered and the efficiency of a specific administrative program reduced.

This court ruling was based on the interpretation of an exemption to the Freedom of Information Act which safeguarded privileged or confidential information. This ruling constitutes a legal precedent but it could very possibly be overturned by the next case which challenges the same issues. In order that the protection of the vessel casualty data can be guaranteed with any degree of certainty, I would propose that the Coast Guard seek specific exemption of Vessel Casualty or Accident data by statute in order to protect this data from release under the Freedom of Information Act.

Exemption three of the Freedom of Information Act covers information "specifically exempted from disclosure by statute." One statutory protection of the data is guaranteed, a reasonably and complete data base can be collected to measure the effectiveness of various marine safety programs such as Vessel Traffic Services.

## CHAPTER IV

### CONCLUSIONS AND RECOMMENDATIONS

Vessel Traffic Management Systems are currently employed in thirty-six locations throughout the world. These systems operate a total of 113 radars to provide surveillance as an integral part of the vessel traffic management function. In addition to these systems, there are an additional estimated 250 harbor radars employed in various ports of the world.

In spite of the difficulty associated with documenting a positive cost-benefit ratio for vessel traffic management systems, there is ample evidence that these systems can be an effective element in a marine safety program.

Since the installation of a fully developed VTS in the port of Rotterdam, there has been a fourfold reduction in the rate of vessel collisions in the approach to Rotterdam in spite of significant increases in port tonnage generated by the rapid economic expansion of the Common Market. Canadian authorities report that since the inception of their vessel traffic control system on the St. Lawrence Seaway in 1968, the number of collisions has been reduced to an average of three per year, compared to an average of 12 serious collisions per year recorded during the period 1964-1967.

This impressive record of safety has been achieved by foreign systems that were primarily constructed to facilitate commerce through enhanced traffic flow. The U.S. Government's

goal in establishing vessel traffic management systems is to improve maritime safety without undue economic hardship. It is reasonable to assume, therefore, that the achievements in vessel safety could be duplicated or even surpassed by a U.S. system that is primarily designed to promote maritime safety.

Foreign vessel traffic management systems differ from U.S. systems in that they are generally funded by private enterprise whereas the U.S. systems are constructed and operated by government funds. This distinction is important when considering that the foreign systems' primary purpose is to facilitate commerce and that this may not be an appropriate use of U.S. government funds. This distinction raises the question of "user charges" at some time in the future when a U.S. vessel traffic management system is enhanced to the point where substantial commercial benefit is derived from the system's operation. Fear of increased port costs through some form of "user charges" is one factor that hinders user acceptance of new vessel traffic management systems although no plans have been made to institute any form of "user charges."

Perhaps the most important difference between foreign vessel traffic management systems and U.S. systems is that the foreign systems are designed to do the best possible job of traffic management and the U.S. systems are designed to provide not even the best level of vessel safety but a specific level of vessel safety at a cost where the cost-benefit ratio

is most favorable. The cost-benefit concept used in the U.S. has sparked a lively debate over the relative merits of low cost "basic" vessel traffic systems in many ports or a comparatively fewer number of more expensive and more sophisticated systems in fewer ports. The term "sophisticated" system has been loosely defined by the GAO as a system with radar and/or television surveillance.

VTS development in the U.S. is still in its infancy and there is little data to resolve the debate over the utility of surveillance in the format of a cost-benefit analysis. All foreign systems have radar surveillance as a means of monitoring vessels that have entered the system, discovering vessels that have not reported into the system and providing credible information during periods of low visibility. Shore based, high-resolution radar can provide superior information to that available to the mariner from the vessel radar. When monitored by a skilled operator, the shore based radar can detect vessels straying out of traffic lanes, potential congestion situations and other hazards not immediately apparent to the mariner on a vessel radar.

Surveillance via radar is an unpopular concept among some members of the maritime community who feel that it is another example of government interference into private industry. However, the day of the free spirited pilot bringing a vessel into port as he sees fit has passed. Increased traffic density, larger less maneuverable vessels

and the increased danger of vessel collisions, groundings and rammings has brought us to a time when the independence of the maritime community must give way to the need for more orderly and safer vessel traffic through our ports and waterways.

This point was addressed by the Department of Transportation in a reply to a GAO report as follows:

The issue of mariner cooperation, also covered in this section of the draft report, is not amenable to simple quantification. The experience of the United States government, in implementing vessel traffic management measures in this country, is not unique. The records of international symposia on the subject contain many references to the initial opposition expressed by prospective users of planned vessel traffic services, and the subsequent near unanimous support achieved once the systems were operational, tried and proved. The draft report, however, does not reflect a balanced view from this perspective. It cites the vocal and highly visible opposition of those few, who may never admit to a change in position--parties who are involved as plaintiffs in an unsuccessful Federal Court suit against the government. While less vocal, and certainly less visible, there are a significant number of mariners whose testimony in support of vessel traffic services before Congressional committees is a matter of record. The absence of reference to this opposite view seriously impairs the credibility of the draft report. If the level of voluntary participation by users of a vessel traffic service is any relative measure of their degree of support, then it should be mentioned that it exceeds 95% in every voluntary VTS in the United States to date, with the exception of VTS New Orleans. In New Orleans, the level of voluntary participation exceeds 60% at present. Considering that this VTS has been in operation for just over a year, and that its effectiveness has been impaired by a lack of budgetary support for surveillance components, the acceptance it has achieved indicates that the majority of the New Orleans<sup>1</sup> marine community does, in fact, support the VTS.

This is not a suggestion to degrade in any way the role of our pilots in the safe operation of vessels in our ports and waterways. Rather, it is a suggestion that all parties who have vested interests in vessel traffic should be brought together into closer cooperation for the common good.

As was previously mentioned above, the Port of Rotterdam has operated a VTS since 1964 that has achieved a fourfold reduction in the rate of vessel collisions in the approach to Rotterdam. The Port of Rotterdam has undertaken a massive program for the improvement of this vessel traffic management system which is far more comprehensive than any similar program in the United States.

This development program is broken down into four phases; an Orientation Phase, a Preparation Phase, a System Development Phase and finally an Implementation Phase. During the Orientation Phase, some 19 interested parties were identified as groups that should participate in the development program. These interested parties included the pilots, ship agents, ship owners, fire department, harbor police, tug operators, systems users, etc.

These interested parties were invited to fill out a questionnaire on what their organization did in the Port of Rotterdam, what problems they had and what they would like to see included in the development of the new VTS. These questionnaires were assembled into a summary report and distributed to all interested parties to permit everyone to learn about

and appreciate the problems of each of the other parties. Comments were solicited from each party and included into the initial design criteria.

This procedure of constant contact with the interested parties has continued throughout the entire development program. A steering committee coordinates the development effort and insures that any conflicting suggestions or requirements are reconciled before further development continues. The process is laborious, time consuming and expensive but offers the advantage that the system finally developed will have the support of all sectors of the maritime community that have participated in its development. The project is scheduled to run over a six year period and will undoubtedly cost in the hundreds of thousands of dollars.

The lesson to be learned from the Port of Rotterdam VTS development project is that extensive consultation with all segments of the maritime industry within a port is the best way to identify potential problems and make accommodations in the system design before any installation of equipment is made. The wealth of experience in the maritime community has not been effectively used in the United States for VTS development.

Another area where the United States could profit from foreign experience is in the area of manning of the vessel traffic management facilities. Almost every European vessel traffic management system is staffed by personnel holding a



Masters Certificate. Several of these systems also require watchstanders to have six years experience at sea in the capacity of Master.

The United States has been staffing VTS systems with Coast Guard enlisted quartermasters on radar watch and with Lieutenants as VTS Watch officers. Most training for these assignments is on the job and not nearly as thorough as that of the foreign system operators.

There would be obvious advantages to manning U.S. VTS facilities with pilots if only during periods of heavy traffic or reduced visibility. One of the immediate problems with this plan is that the salaries of most pilots is substantially greater than the salaries of the personnel presently manning the VTS facilities. This alternative would be more costly than the present mode of operation, but the increased level of expertise in the VTS would be an excellent investment in maritime safety.

There are many initiatives under consideration in the United States to improve maritime safety such as traffic separation lanes, improved channel and turning basin design, vessel speed limits and traffic scheduling schemes. All of these initiatives show promise but the vessel traffic management option has proven successful in many ports in many countries for many years. The United States must recognize that continued development of Vessel Traffic Management is a necessary and profitable use for scarce federal funds.

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1. U.S. Coast Guard, Vessel Traffic Systems - Analysis of Port Needs (Washington: 1973), p. 11.
2. Ibid., p. 14.
3. Ibid., p. 16.
4. General Accounting Office, Comptroller General of the U.S., Vessel Traffic Systems -- What is Needed to Prevent and Reduce Vessel Accidents (Washington: 1975), p. 11.
5. Ibid., p. iv.
6. Commandant, U.S. Coast Guard, "Statement on the GAO Report, Vessel Traffic Systems -- What is Needed to Prevent and Reduce Vessel Casualties[sic], p. 6-14.

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1. Lany Booda, "Ship Traffic Control, the National Tower of Babel," Sea Technology, March 1979, p. 11.
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APPENDIX A

NEW ORLEANS CASUALTY LOSS REDUCTION ANALYSIS

Source: U.S. Coast Guard, Vessel Traffic Systems  
Analysis of Port Needs (Washington, 1973), p. B-1  
through B-10.



SUMMARY OF RESULTS  
PORT/WATERWAY OF New Orleans

1. ALGORITHM RESULTS<sup>1</sup>

a. Annual Estimated Damages C/R/G	\$ <u>1584</u>	x 10 <sup>3</sup>
b. Annual Estimated Damages C/R/G Adjusted	\$ <u>4765</u>	x 10 <sup>3</sup>
c. Annual Estimated Damages Bridge to Bridge Radio (L <sub>0</sub> ) Compensated	\$ <u>4714</u>	x 10 <sup>3</sup>
d. Annual Estimated Pollution Incidents	<u>3.648</u>	
e. Annual Estimated Deaths/Injuries	<u>6.434</u>	
f. VTS Level Recommended <sup>2</sup>	<u>2L<sub>2</sub>L<sub>3</sub></u>	
g. Estimated # C/R/G Prevented	<u>106</u>	Vessels
h. % Reduction C/R/G	<u>19%</u>	
i. Estimated Annual Damage Reduction	\$ <u>811</u>	x 10 <sup>3</sup>
j. Estimated Annual Pollution Reduction	<u>22</u>	%
k. Estimated Annual Death/Injury Reduction	<u>21</u>	%
l. C/R/G Cases Investigated FY69-72	<u>237</u>	
m. Vessels Involved in C/R/G FY69-72	<u>564</u>	

2. COMMODITY AND TRANSIT DATA<sup>3</sup> (ANNUAL AVERAGES)

a. Total Commerce	<u>152,000,000</u>	Short Tons
b. Petroleum and Petroleum Products	<u>63,100,000</u>	Short Tons
c. Chemicals and Chemical Products	<u>10,500,000</u>	Short Tons
d. Transits		
(1) Five Vessel Type <sup>4</sup>	<u>154,000</u>	
(2) Tankers and Tank Barges	<u>40,900</u>	

<sup>1</sup>Casualty Data from MVCRR Files FY69-72, item g-k are Bridge to Bridge Radio (L<sub>0</sub>) Compensated

<sup>2</sup>Recommendations are made for each sector of algorithm application. If this item is L<sub>0</sub>, item g thru k will be zero (0) as they do not account for reductions by L<sub>0</sub>. Only reductions from L<sub>1</sub>-L<sub>5</sub> are included.

<sup>3</sup>Data from Waterborne Commerce Statistics FY68-71

<sup>4</sup>Passenger and Dry Cargo, Tankers, Tank Barges, Cargo Barges, Tugboat or towboat.

### Algorithm Application Sectors

The Mississippi River from Passes to Mile 129 above New Orleans was divided into 3 sectors for algorithm application:

1. Passes to Mile 14 (Venice)
2. Mile 14 to Mile 80 (Venice to Twelve Mile Pt)
3. Mile 80 (Twelve Mile Pt) to Mile 129 including a 40 mile portion of the ICW, 20 miles east and west of Harvey Locks

Commodity and transit data figures are for the Mississippi River from New Orleans to the Mouth of Passes as defined in the COE, Waterborne Commerce Statistics.

### VTS Levels

- L<sub>0</sub> - Bridge to Bridge Radiotelephone
- L<sub>R</sub> - Special Regulations
- L<sub>2</sub> - Vessel Movement Reporting System (VMRS)
- L<sub>3</sub> - Basic Surveillance
- L<sub>4</sub> - Advanced Surveillance
- L<sub>5</sub> - Automated Advanced Surveillance System

### Discussion of Findings

237 cases involving 564 vessels were reviewed.

Area 1: 72 cases involving 117 vessels were within this area. 13 (32 vessels) were considered preventable with VTS levels up to L<sub>3</sub>.

Of the 59 unpreventable accidents, 19 (33 vessels) were collisions caused by material failures, wind, current and operator's errors.

25 (33 vessels) were groundings: 7 (11 vessels) were due to wind and current; 9 (12 vessels) were due to operator's errors and 4 (4 vessels) were due to channel shoaling.

7 (9 vessels) were dock, docking or undocking incidents caused by wind or current conditions.

7 (9 vessels) were anchorage, anchoring or weighing anchors incidents caused by operator's errors or hurricane winds.

Area 2: 29 cases involving 63 vessels were within this area. 10 (27 vessels) were considered preventable with VTS levels up to L<sub>2</sub>.

Of the 19 unpreventable accidents, 10 (18 vessels) were dock, docking or undocking incidents due to wind, current, parted moorings or operator's errors. 4 (11 vessels) were anchorage, anchoring or weighing anchor incidents due to hurricane winds or current. The remaining 5 (7 vessels) unpreventable accidents were collisions and groundings due to material failures and operator's errors.

Area 3: 137 cases involving 384 vessels were within this area. 38 cases (124 vessels) were considered preventable by VTS levels up to L<sub>5</sub> however only 1 case was considered preventable by that level. Included in these 38 were 4 (8 vessels) rammings of bridges which were considered

preventable by implementation of regulations requiring bridge tenders to maintain a radio guard on the Bridge to Bridge Radiotelephone frequency and for vessels to make timely radio contact with bridge tenders to insure safe passage of bridge draws.

Of the 99 (260 vessels) unpreventable cases, 32 (69 vessels) were dock, docking or undocking incidents: 11 (27 vessels) were due to parted moorings; 5 (13 vessels) were due to current; 8 (16 vessels) were due to operator's errors; 6 (11 vessels) were collisions between vessels and their assisting tugs and 2 (2 vessels) were due to material failures.

30 (60 vessels) were ramblings: 27 (54 vessels) were bridge ramblings of which 17 (33 vessels) were due to wind and current, 6 (14 vessels) due to operator's errors, 3 (4 vessels) due to material failure and 1 (3 vessels) due to hitting a submerged object; the 3 (6 vessels) remaining were ramblings of other fixed objects due to operator's errors.

24 (97 vessels) were collisions: 9 (43 vessels) were due to operator's errors; 6 (27 vessels) were due to wind and current; 7 (27 vessels) were due to power failure, material failure, maneuvering problems or unlighted barges.

12 (27 vessels) were anchorage, anchoring or weighing anchor incidents and 4 (6 vessels) were groundings due to uncharted shoals, currents and operator's errors.

In all 3 areas there were 15 groundings that might have been preventable if some form of precision navigation were on board the vessels.

## Recommendations

The following recommendations for a VTS are made based on the results of the algorithm.

### PHASE I:

1. VMRS coverage from Passes to Mile 35 with consideration for "NO PASSING" bends in the vicinity of Mile 20 and Mile 35.
2. VMRS coverage from Mile 75 to Mile 129 with "NO PASSING" bends at Mile 77 (English Turn Bend), Mile 80 (Twelve Mile Pt. Bend), Mile 94 (Algiers Point), Mile 96 (Gouldsboro Bend), Mile 100 (Westwego), and Mile 104 (Nine Mile Pt.).
3. "AVOID PASSING" at Mile 60 bend and all bends from Mile 109 to Mile 125.
4. Algorithm results indicate some form of surveillance is necessary from Mile 75 to Mile 109. This need should be evaluated during Phase I.

### PHASE II:

1. Surveillance from Mile 75 to Mile 109 if Phase I traffic analysis substantiates the need indicated by the algorithm results.

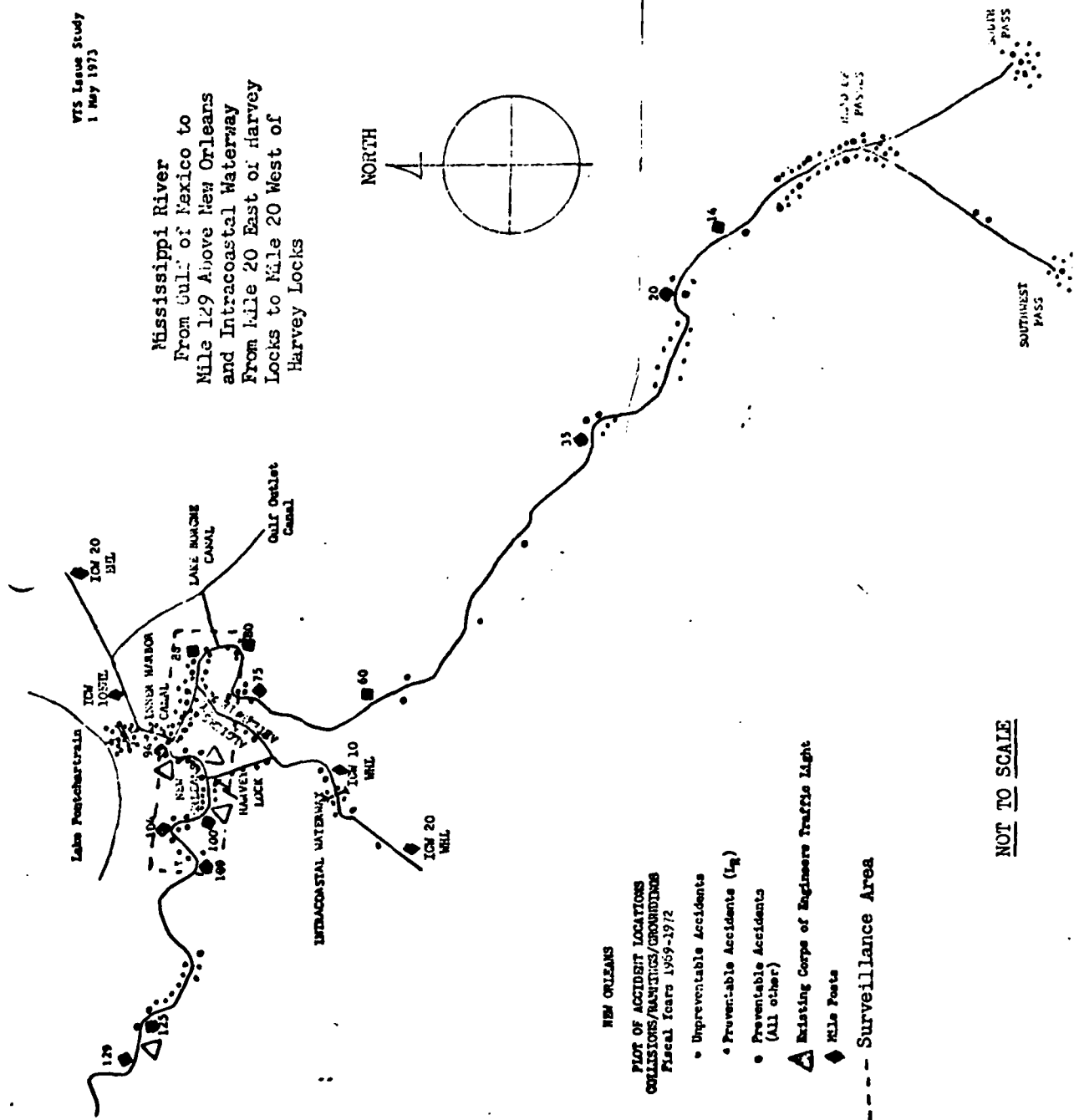
### VESSEL BRIDGE TO BRIDGE RADIOTELEPHONE COMMUNICATIONS:

1. Small crewboats operating in the delta account for 6% of the accidents and 5% of the vessels involved in accidents for the area from Passes to Mile 129. Consideration should be given to requiring these crewboats to comply with the provisions of the Bridge to Bridge Radiotelephone Act through exercise of the authority of the P&WS Act.

2. Although only 4 (8 vessels) bridge ramming were considered preventable by implementation of regulations, consideration should be given to requiring bridgetenders to monitor a designated VTS frequency and requiring vessels to establish timely radio contact with bridgetenders to allow safe passage of bridge draws.

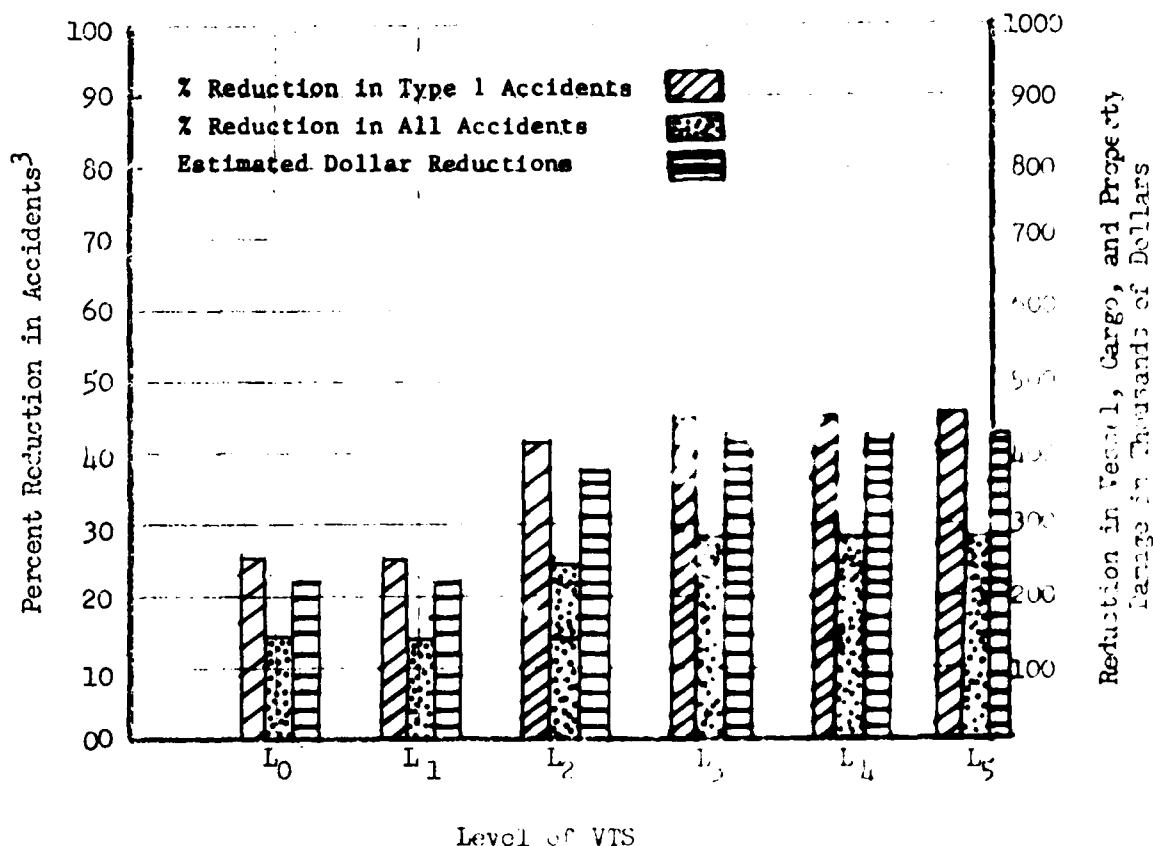
WTS Lease Study  
1 May 1973

Mississippi River  
From Gulf of Mexico to  
Mile 129 Above New Orleans  
and Intracoastal Waterway  
From Mile 20 East of Harvey  
Locks to Mile 20 West of  
Harvey Locks



Estimated Annual Reduction in Accidents and Damages by  
VTS Level<sup>1</sup>  
(Cumulative)

Port or Waterway of New Orleans - Passes<sup>2</sup>



<sup>1</sup> Results of application of CSC Algorithm using Casualty Data from FY69-72: includes the Estimated reduction resulting from the Vessel Bridge-to-Bridge Radiotelephone Regulations (L<sub>0</sub>), which became effective 1 January 1973.

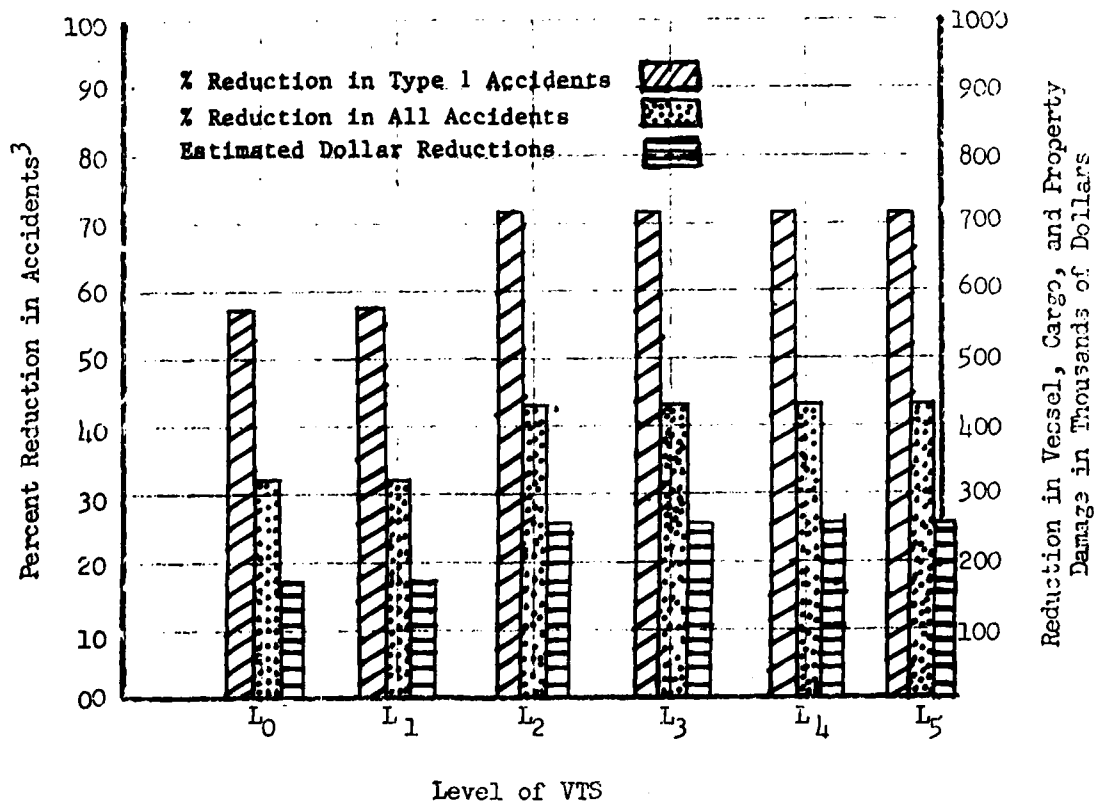
<sup>2</sup> Area included: South Pass, Southwest Pass, Mississippi River from Head of Passes to mile 19 AHP. Chart: C&GS 1272.

<sup>3</sup> Total number of vessels involved in Type 1 accidents: 63.  
Total number of vessels involved in all accidents: 117. (FY69-72)  
The percent reduction in accidents is computed using the total number of vessels in accident. An accident is defined as any collision, ramming or grounding incident. Type 1 Accident: Collision between 2 or more moving vessels.



Estimated Annual Reduction in Accidents and Damages by  
VTS Level<sup>1</sup>  
(Cumulative)

Port or Waterway of New Orleans (Venice<sup>2</sup>  
to 12 Mile Pt.)



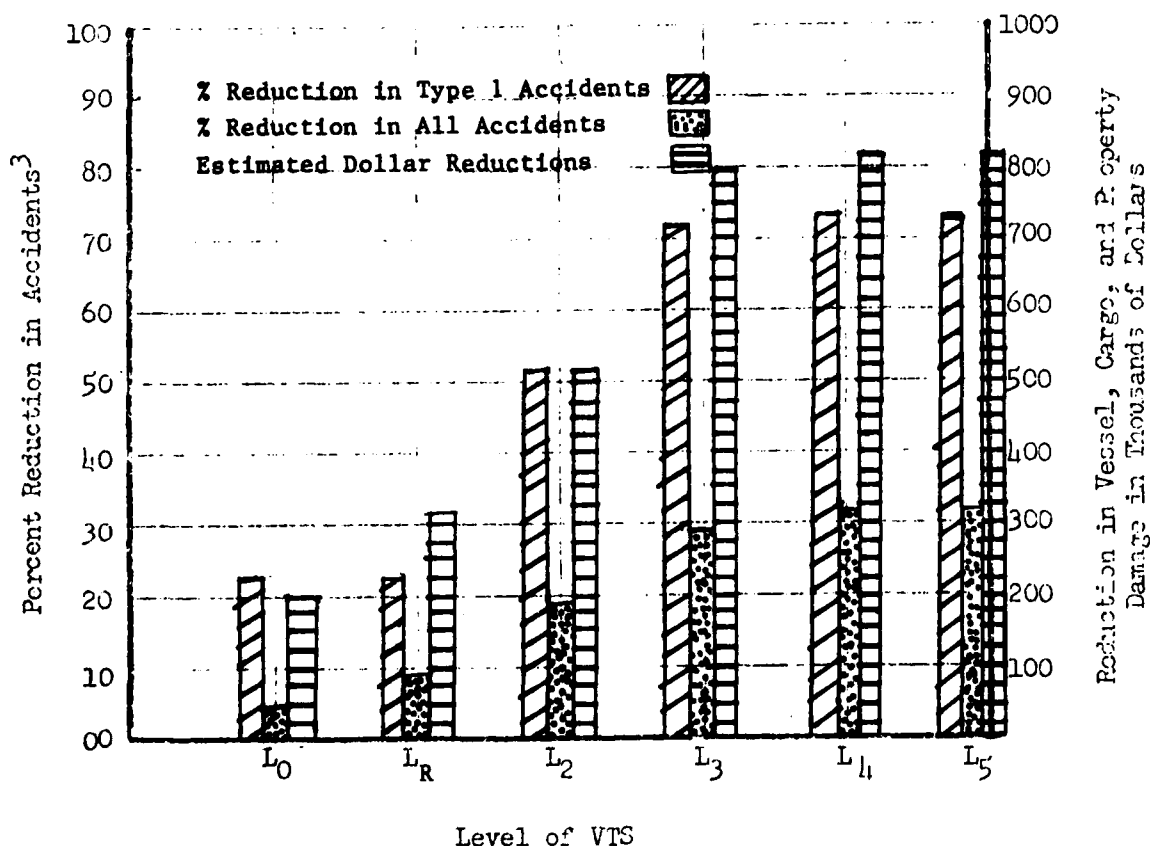
<sup>1</sup>Results of application of CSC Algorithm using Casualty Data from FY69-72: includes the Estimated Reduction resulting from the Vessel Bridge-to-Bridge Radiotelephone Regulations (L<sub>0</sub>), which became effective 1 January 1973.

<sup>2</sup>Area included: Mississippi River from mile 20 to mile 79 AHP. Chart: C&GS 1271.

<sup>3</sup>Total number of vessels involved in Type 1 accidents: 32  
Total number of vessels involved in all accidents: 63. (FY69-72)  
The percent reduction in accidents is computed using the total number of vessels in accident. An accident is defined as any collision, ramming or grounding incident. Type 1 Accident: Collision between 2 or more moving vessels.

Estimated Annual Reduction in Accidents and Damages by  
VTS Level<sup>1</sup>  
(Cumulative)

Port or Waterway of New Orleans (Sector 3)<sup>2</sup>



<sup>1</sup> Results of application of CSC Algorithm using Casualty Data from FY69-72; includes the Estimated Reduction resulting from the Vessel Bridge-to-Bridge Radiotelephone Regulations (L<sub>0</sub>), which became effective 1 January 1973.

<sup>2</sup> Area included: Mississippi River from mile 80 through mile 129 AHP; ICW from mile 20 EHL to mile 20 WHL. Charts: C&GS 1269, 1270, 1271, and 878-SC.

<sup>3</sup> Total number of vessels involved in Type 1 accidents: 113.  
Total number of vessels involved in all accidents: 384. (FY69-72)  
The percent reduction in accidents is computed using the total number of vessels in accident. An accident is defined as any collision, ramming or grounding incident. Type 1 Accident: Collision between 2 or more moving vessels.

APPENDIX B

INSTRUCTIONS FOR USE OF RCP SCORING SYSTEM

Source: RADM Stewart's memorandum CPA 7120.1 dated  
23 January 1980 entitled RCP Scoring System.

### INSTRUCTIONS FOR USE OF RCP SCORING SYSTEM

1. In scoring individual RCP's please be guided by the following for each RCP:

a. Answer every question separately, blocking all the others from your mind. The interrelationship of the various questions will take care of itself as total scores are calculated. Select the answer which best describes what is actually written in the RCP. If there is information which is important but is not included in the RCP - do not grade it - return it to the originator for correction.

b. Select the answer whose wording best describes the RCP.

c. Try to avoid second-guessing, forcing the system or complex interpretations of the wording. (The questions are meant to be straightforward and taken literally.)

d. Where your RCP simply will not fit a literal use of the question's wording, base your score on the sense of the wording in the context of the whole question.

2. To derive your score, multiply the numerical value of the answers you select by the weighting factors given in Enclosure (2) for each RCP submitted.

3. REMEMBER - The scoring system is not a precise mathematical procedure. It is a tool . . . just one of many considerations that will ultimately decide the priority of any given item and the scope and appearance of next year's budget request. Please use it in the spirit in which its use is intended.

4. Additional copies of enclosure (2) are available in G-CPA, Room 8420.

### RCP Scoring System

A. To what extent will this contribution to accomplishing Coast Guard goals, objectives and priorities as called out in Long Range View. Plans Summaries, CG-411 and facility plans?

1. No contribution; departs from the planned course; inconsistent with LRV, and/or Plan Summaries.

3. Essentially a hold-the-line-effort -- not inconsistent with goal or objective, but contributes little to forward progress.

5. Action proposed is consistent with goals and objectives, constitutes a routine request in moving forward toward their ultimate realization.

7. Makes a significant stride forward toward achieving a goal or objective.

9. Is a quantum step toward achieving a broad goal or objective.

B. What is the mandate for carrying out this action?

1. None. Action is contrary to specific decisions, on policy or methods of operations, made by the Commandant or higher authority.

3. Action represents significant change from previous policy/methods of operations and has not been addressed in Determinations.

5. Action is consistent with Commandant's Determinations or involves routine ongoing matters associated with existing methods of operation.

7. Action is based on CG or DOT policy, formal agreement or Commandant's direction which specifically requires it.

9. Action is based on Public Law or Treaty which specifically requires it.

C. Size of public directly benefited by output of change.

1. None or even a disbenefit.
3. Some implicit benefit but hard to specify.
5. Will generally improve mission performance and thereby produce some benefit to public at large; or of benefit to the public in general in a locale with population of less than 100,000.
7. Will significantly improve mission performance and thereby be of benefit to an identifiable segment of the public or to the public in general in a specific locale with population of 100,000 to 1,000,000 people.
9. Of major benefit to a large part of the public, that is it will directly improve service to a minimum of 1,000,000 people.

D. Relation of benefits/outputs generated by proposal to resource cost.

1. Benefits/outputs unknown or not furnished so specific relationship to cost cannot be determined or relationship is so vague as to make it questionable.
3. Benefits/outputs will be about equal to cost; intangible benefits not significant in terms of improved effectiveness of program or support function.
5. Benefits/outputs will exceed cost by a ratio of at least 1.2:1 or, if intangible, promises 10-30% improvement in effectiveness of program or support function; or cost-benefit not a factor.
7. Benefits/outputs will exceed cost by a ratio of at least 1.6:1 but no more than 2:1 per annum or, if intangible, promises 30-60% improvement in effectiveness of program or support function.
9. Benefits/outputs will exceed cost by better than 2:1 ratio per annum or, if intangible, promises over 60% improvement in effectiveness of program or support function.

E. What will be the effect on the workload of present personnel?

1. Will cause absorption of 10 man years or more of new duties; is a people-intensive program.
3. Will cause some minor increase in workload.
5. No noticeable change.
7. Will result in a decrease of up to 10 man years in workload as it presently exists.
9. Will result in a decrease of more than 10 man years in workload on present personnel.

F. How will this affect present living conditions?

1. Substantially reduce their availability and/or habitability.
3. Will cause some inconvenience and/or discomfort.
5. No effect.
7. Some improvement in space available or physical conditions for less than 15 people.
9. Some improvement in space available or physical conditions for more than 15 people.

G. How will this affect present working conditions and safety?

1. Creates a requirement for personnel to work under particularly hazardous conditions; causes serious over crowding or an unpleasant or detrimental working environment.
3. Requires duties involving some degree of personal hazard; causes some inconvenience or discomfort.
5. No appreciable effect on existing working conditions.
7. Reduces hazardous conditions or the frequency with which they are encountered; improves space and working environment for up to 50 people.
9. Eliminates serious safety hazards or the need to perform under particularly hazardous conditions; improves space and working environment for more than 50 people.

H. What is the effect on personnel retention?

1. Will have an adverse impact on 50 or more Coast Guard personnel thereby adversely affecting likelihood of reenlistment or remaining in the service.

3. Will have an adverse impact on less than 50 Coast Guard personnel.

5. Proposal has little positive or negative impact on retention.

7. This proposal will materially improve the probability of retention of up to 50 personnel.

9. This proposal will materially improve the probability of retention of more than 50 personnel.

I. What is the impact on physical plant?

1. Seriously overloads capability to meet existing mission requirements which must still be met.

3. Places additional demands on existing plant but not to extent of eroding capacity for present missions.

5. Has no effect or replaces in kind at a level of present capability.

7. Renovates or expands existing plant to restore lost capability up to level required by present missions or to provide for normal moderate growth in present missions.

9. Provides new capacity essential to meet the requirements of newly enacted/ratified Laws/Treaties.

J. What is the impact on training and/or professionalism?

1. Seriously overloads existing training resources. Degrades professionalism and quality of existing resources.

3. Will result in some overload of existing training resources. Fails to compensate for additional training requirements through increased management effectiveness.

5. Has no effect on training or professionalism.

7. Enhances training and/or professionalism, with minimal additional resource requirements.

9. Significantly enhances training and/or professionalism. Utilizes existing resources to accomplish the objective of the RCP.



K. What is the impact on the environment?

1. Environmental impact assessment is required and has not been performed; or if assessed has been found to show a major adverse effect which cannot be compensated for or reversed; or if the assessment requirement not applicable, item would have a negative impact on the environment.

3. Environmental effects, while adverse, will be minor and/or short term and/or can be overcome with reasonable amount of additional funding; or if pollution equipment involved will contribute to pollution prevention, containment or cleanup but duplicate commercial or other sources.

5. Environmental impact statement or negative declaration has been assessed or a determination has been made that neither are necessary. The environmental effects have been found to be insignificant or the net effect will be no change in present state; or if pollution equipment is involved will contribute to prevention, containment or clean up capability.

7. Environmental impact statement or negative declaration has been assessed. Net effect will be a slight improvement in the environment in general or major improvement at a specific locations; or if pollution equipment is involved will contribute significantly to prevention, containment or clean up capability.

9. Action proposed will lead to substantial improvement in the overall quality of the environment; or item will contribute extensively to prevention, containment or clean up.

L. What is the effect on energy consumption?

1. Will result in major increase in energy consumption (in excess of 10,000 gal. or 50,000 KW per year) over current uses.

3. Will result in minor additional energy consumption (of up to 10,000 gal. or 50,000 KW per year) over current uses.

5. Very little or no change.

7. Will result in conservation of up to 10,00 gal. of fuel or 50,000 KW per year.

9 Will result in conservation of over 10,000 gal. of fuel or 50,000 KW per year.

AD-A095 102

NAVAL WAR COLL NEWPORT RI CENTER FOR ADVANCED RESEARCH  
CG VESSEL TRAFFIC SERVICE PROGRAM.(U)  
JUN 80 P T POTTER

F/G 5/1

UNCLASSIFIED

NL

2 of 2  
AD-A  
DPA102



END

DATE

FILED

3-81

DTIC

RCP SCORE SHEET

RCP \_\_\_\_\_ I.D. \_\_\_\_\_ TITLE \_\_\_\_\_

FACTORS

Raw Score x Weight = Total

A. Contribution to Long Range Goals or Objectives	_____ x 8	= _____
B. Mandate for Carrying Out Action	_____ x 11	= _____
C. Size of Public Benefited	_____ x 10	= _____
D. Relationship of Benefits/Outputs to Costs	_____ x 10	= _____
E. Effect on Personnel Workload	_____ x 8	= _____
F. Effect on Present Living Conditions	_____ x 8	= _____
G. Effect on Present Working Conditions and Safety	_____ x 7	= _____
H. Effect on Personnel Retention	_____ x 10	= _____
I. Impact on Physical Plant	_____ x 7	= _____
J. Impact on Training and Professionalism	_____ x 10	= _____
K. Impact on Environment	_____ x 3	= _____
L. Effect on Energy Consumption	_____ x 8	= _____

TOTAL \_\_\_\_\_

INSTRUCTION: COMPLETE IN LONGHAND: ATTACH TO ORIGINAL OF RCP.

DEPARTMENT OF TRANSPORTATION U. S. COAST GUARD CGHQ-4302A (Rev. 12-71)	<b>RESOURCE CHANGE PROPOSAL PART I - SUMMARY</b>	1. PROGRAM <b>PSS 31</b> 2. RCP NO. <b>555</b> 3. ID <b>30-35</b> 4. BY <b>187 4</b>					
5. RCP TITLE <b>Vessel Traffic Systems - New Orleans</b>							
6. PURPOSE <b>Implement a VTS from Baton Rouge to the Gulf of Mexico</b>							
APPROXIMATION OF NET RESOURCE CHANGES REQUIRED	BUDGET YEAR TOTAL COST (\$000'S)	TOTAL PERSONNEL MIL    CIV		5-YEAR TOTAL COST (\$000'S)	TOTAL MAN YEARS MIL    CIV		
7. ALTERNATIVE A Phase 1 VMRS Baton Rouge to Gulf, improved A to N Phase II CCTV and radar surveillance vicinity of New Orleans	1700	0	0	8266	160	0	
8. ALTERNATIVE B Complete system in one year	4600	0	0	9392	156	0	
9. ALTERNATIVE C Implement VMRS Baton Rouge to Gulf, improve A to N	2350	0	0	4938	153	0	
10. ALTERNATIVE D Implement a two phase VMRS Baton Rouge to Gulf, improve A to N, CCTV	1700	0	0	5346	113	0	
11. IF APPROVED, WILL THIS CONSTITUTE A NEW OR SIGNIFICANTLY CHANGED ENDEAVOUR FOR THE COAST GUARD? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO --- IF YES, WHAT IS THE AUTHORITY OR MANDATE FOR IT?  IF THE AUTHORITY OR MANDATE IS NON-STATUTORY ATTACH DOCUMENTATION. DOCUMENTATION ATTACHED <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO							
12. IS LEGISLATION REQUIRED? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO							
13. IS AN ENVIRONMENTAL IMPACT STATEMENT REQUIRED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DONE							
14. THE FOLLOWING SUPPORT MANAGERS HAVE BEEN CONSULTED IN PREPARING THIS RCP - <input checked="" type="checkbox"/> GAP <input checked="" type="checkbox"/> GAE <input type="checkbox"/> GAF <input checked="" type="checkbox"/> GAC <input type="checkbox"/> R&D GA SPECIFY: <input type="checkbox"/> MEDICAL <input type="checkbox"/> LEGAL <input type="checkbox"/> IG    OTHERS _____							
15. THE FOLLOWING PROGRAM MANAGERS WHOSE PROGRAMS/FACILITIES ARE AFFECTED BY THIS CHANGE HAVE BEEN CONSULTED:  <div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%;"><input checked="" type="checkbox"/> AN</div> <div style="width: 33%;"><input type="checkbox"/> DI</div> <div style="width: 33%;"><input type="checkbox"/> LC</div> <div style="width: 33%;"><input type="checkbox"/> MP</div> <div style="width: 33%;"><input type="checkbox"/> OS</div> <div style="width: 33%;"><input type="checkbox"/> PSS</div> <div style="width: 33%;"><input type="checkbox"/> SAR</div> <div style="width: 33%;"><input type="checkbox"/> BA</div> <div style="width: 33%;"><input type="checkbox"/> ELT</div> <div style="width: 33%;"><input type="checkbox"/> MEP</div> <div style="width: 33%;"><input type="checkbox"/> MSA</div> <div style="width: 33%;"><input type="checkbox"/> POS</div> <div style="width: 33%;"><input type="checkbox"/> RBS</div> <div style="width: 33%;"><input type="checkbox"/> CVS</div> <div style="width: 33%;"><input type="checkbox"/> LA</div> <div style="width: 33%;"><input type="checkbox"/> MO</div> <div style="width: 33%;"><input type="checkbox"/> OM</div> <div style="width: 33%;"><input type="checkbox"/> POW</div> <div style="width: 33%;"><input type="checkbox"/> RT</div> <div style="width: 33%;"><input type="checkbox"/> _____</div> </div>							
16. IF AC&I FUNDS HAVE BEEN REQUESTED, HAS AN AC&I PROJECT BEEN SUBMITTED? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO    REVIEW COMPLETED? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO							
17. RCP PREPARED BY <b>R. L. ZEIDERS, LT</b>		18. TEL. NO. <b>61940</b>		19. DATE PREPARED <b>6/15/73</b>		20. PROGRAM/SUPPORT MANAGER SIGNATURE <b>K. L. MOSER</b>	
21. PROGRAM/SUPPORT DIRECTOR SIGNATURE						22. DATE APPROVED	

MISSISSIPPI RIVER CASUALTY STATISTICS  
HEAD OF PASSES TO BATON ROUGE  
1970 and 1971

I. Port of New Orleans (including Barataria Bay, Ship Shoal  
Lt, Lake Charles and Point in Per  
Reef Lt)

<u>Collisions</u>	<u>Groundings</u>
48	19

II. Mississippi River

<u>Mile*</u>	<u>Collisions</u>	<u>Groundings</u>
0-10	8	1
10-20	11	6
20-30	5	1
30-40	2	-
40-50	-	1
50-60	2	;
60-70	12	-
70-80	24	-
80-90	5	1
90-100	1	1
100-110	-	1
110-120	-	-
120-130	-	-
130-140	-	-
140-150	-	-
150-160	-	-
160-170	-	-
170-180	1	-
180-190	-	-
190-200	1	1
200-210	1	-
210-220	1	2
220-230	2	-
230-240	-	1
0-240 Total	78	17

\*Mile 0 is Head of the Passes, City of New Orleans is  
mile 90-110 and Baton Rouge is mile 230.

DEPARTMENT OF TRANSPORTATION U. S. COAST GUARD CGHQ-4302C (Rev. 8-73)	<b>RESOURCE CHANGE PROPOSAL</b> <b>PART I - ANALYSIS</b>	1. PROGRAM PSS 31		
8. RCP TITLE NEW ORLEANS VESSEL TRAFFIC SYSTEM		2. RCP NO. 555	3. ID 30-35	4. BY 1974
6. THIS RCP IS INTENDED TO: <input checked="" type="checkbox"/> SOLVE A PROBLEM <input checked="" type="checkbox"/> REACH A GOAL ENROUTE TO A LONG RANGE OBJECTIVE IT IS: <input type="checkbox"/> INCLUDED IN DETERMINATIONS <input type="checkbox"/> NOT INCLUDED IN DETERMINATIONS (Explain in Block 9 below)				
7. NARRATIVE DESCRIPTION OF PROBLEM OR GOAL (Complete here)  GOAL: Implement a VTS on the lower Mississippi River from Baton Rouge to the Gulf of Mexico. Problem: Approximately 150,000 ships and barges travel the waterway annually. During a 13-month period in 1968-69, three serious collisions occurred with 63 lives lost. From FY 69 through FY 71, 116 collisions or groundings occurred the river below Baton Rouge - this averaged roughly 3.2 collisions/groundings per month for the intended system area. An item common to many collision investigations is the lack of communication between involved vessels and its contributing significance.				
8. CRITERIA (Quantitative) (Use short statements of fact, NOT complete sentences)  (1) The VTS is intended to provide a centralized coordinating facility to monitor vessel movements and assist mariners in safely transiting the waterway by providing centralized control that can reduce the probability of collisions and the pollution potential.  (2) See attached casualty figures.				
9. BACKGROUND (Complete here)  Vessel traffic systems have been implemented in Puget Sound, San Francisco, and are planned for Houston and New York.				

DEPARTMENT OF TRANSPORTATION U. S. COAST GUARD CGHQ-4302D (Rev. 12-71)	<b>RESOURCE CHANGE PROPOSAL</b> <b>PART I - ANALYSIS (Cont'd)</b>	1. PROGRAM <b>PSS</b>		
		2. RCP NO. <b>555</b>	3. ID <b>30-35</b>	4. BY <b>1974</b>

5. RCP TITLE  
**VESSEL TRAFFIC SYSTEMS - NEW ORLEANS**

Below and on the next 3 sheets analyze 4 alternative courses of action that would in whole or partially, solve the problem or attain the goal. The "don't do it" alternative is presumed as a fifth choice, so do not include it. Discuss the alternatives in the order of priority. Use only the space provided. Do not extend to extra pages.

6. ALTERNATIVE **(A)** (Preferred Alternative)

7. DESCRIPTION Implement a VTS for the Lower Mississippi River from Baton Rouge to the Gulf of Mexico.  
 Phase I - Control Center, VMRS from Head of Passes to Baton Rouge, Improved A to N.  
 Phase II - Install CCTV and RADAR in the vicinity of New Orleans  
 Precom Detail of 2+0+3+0 provided in RCP 555 ID 2.

8. APPROXIMATION OF NET RESOURCE CHANGES REQUIRED (\$000's)

	BY	BY + 1	BY + 2	BY + 3	BY + 4	5 YR CUM. TOTAL
AC&I	1700		2700			4200
R&D/BA						
OL/RT (L OR H)		696	696	1337	1337	4066
PLRS. CHANGES - EOY						
OFF. TWO (NL. CIV.)	0+0+0+0	9+0+25+0	9+0+25+0	9+0+37+0	9+0+37+0	38+0+127+0

9. Benefits Expected (Include Outputs where appropriate)  
 Quantitative (Equate to criteria where possible) -  
 This system is expected to reduce collisions by 60% in Phase I and 90% in Phase II

Phase I

Traffic Center	658K	3 CCTV Sites-OpCen Modem	801K
Comm Sites 7 ea.	352K	M/W equip	550K
M/W Equip.	390K	Modem	307K
A to N	300K	Radar	842K
	1,700K	Software	200K
			2,700K

Other

10. Impact on CG People  
 Workload - COTP New Orleans, CCGD8, Hq Sm will have a substantial increase in workload in FY 74-77  
 Living Conditions - Consistent with improved habitability standards  
 Working Conditions (Incl. Safety) - System standards will meet or exceed current safety requirements for operating personnel. Additional QM & RD shore billets

11. Impact on Supporting Activities and other Programs  
 R&D - Require continuing research into more efficient/cost effective system element and integration of these findings into New Orleans VTS.  
 Training - Minimum of 3 months for watchstanders before assuming duties  
 Eng. & Maintenance - Design construction and maintenance of system will increase work by arbitrary factor of 1.0 in FY - 74 and 1.6 in FY - 74  
 Supply & Contracting - Equipment procurement and support will increase work by a factor of 1.0 in FY - 74 and 1.6 in FY - 75 and 1.8 in FY - 76.  
 Other (Specify) - These will be a requirement for mature and experienced line officers.

DEPARTMENT OF  
TRANSPORTATION  
U. S. COAST GUARD  
CGHQ-4302E (Rev. 12-71)

RESOURCE CHANGE PROPOSAL  
PART I - ANALYSIS (Cont'd)

1. PROGRAM

PSS 31

2. RCP NO.

555

3. ID

30-35

4. BY

1974

5. RCP TITLE

NEW ORLEANS VTS

6. ALTERNATIVE (B)

7. DESCRIPTION

Implement a VMRS from Baton Rouge to the Gulf of Mexico with OCTV and RADAR in the Port of New Orleans

8. APPROXIMATION OF NET RESOURCE CHANGES REQUIRED (\$000's)

	BY	BY+1	BY+2	BY+3	BY+4	5-YR CUM. TOTAL
ACAI	4,600					4,600
R&D/BA						
OE/RT (+OR-)		1198	1198	1198	1198	4,792
PERS. CHANGES-EOY +OFF.+WO.+ENL.+CIV.		9+0+30+0	9+0+30+0	9+0+30+0	9+0+3+0	36+0+120+0

9. Benefits Expected (Include Outputs where appropriate) (Quantitative) (Equate to criteria where possible).

Will reduce collisions by 90% and satisfy all criteria

Other

10. Impact on CG People

Workload - COTP New Orleans, COGD8, and HQ SM will have an increase in workload by a factor of 3.0 (Compared to Alt. A.) in FY 73 and 74.

Living Conditions - Consistent with current habitability standards

Working Conditions (Incl. Safety) - Standards for system will meet or exceed existing requirement. Additional QM's and RD's will be assigned ashore.

11. Impact on Supporting Activities and Other Programs

R&D - Continuing research for system application.

Training - 3 months training required by watchstanders before assuming duties.

Eng. & Maintenance - Design, construction & system maintenance will increase workload by a factor of 2.6 (compared to Alt. A) in FY 74.

Supply & Contracting - Equipment procurement and support will increase workload by a factor of 2.6 (compared to Alt. A) in FY 74

Other (Specify) - The requirements for experienced and mature VTS personnel will have to be met by a limited manpower supply.

12. Why is this Alternative not preferred?

The system is too extensive to be implemented in a single year.



APPENDIX C  
EXAMPLES OF MERCHANT VESSEL CASUALTY REPORTS

Two representative merchant vessel casualty reports, reproduced in toto, are included on the following pages.

The first report, case serial number 72865, contains (1) the endorsements of the Marine Inspection Officer In Charge and the Coast Guard District Commander, (2) a letter of transmittal from the Investigating Officer, and (3) U.S.C.G. form CG-2692 prepared by the vessel master. This report is most typical of the scope and depth of information available for each incident. If more than one vessel is involved in a casualty, each vessel master will prepare a form CG-2692.

The second report, case serial number 71355, contains the same enclosures. The significant difference is the extensive narrative contained in the Findings of Fact prepared by the investigating officer. This sort of detailed analysis is generally documented in cases where pollution resulted, deaths occurred, or a collision between vessels resulted in extensive damage.

Source: U.S. Department of Transportation, Transportation Systems Center, Offshore Vessel Traffic Management (OVTM) Study Vol. III (Cambridge, Mass., 1978), p. A-1-20.

72865.


16732/MMIS 21879  
18 October 1977

FIRST ENDORSEMENT on I. O., Philadelphia, PA report 16732/MMIS 21879 of  
18 October 1977

From: Officer In Charge, Marine Inspection, Philadelphia, PA  
To: Commandant (G-MMI-1/83)  
Via: Commander, Third Coast Guard District (mvs)

Subj: M/V [REDACTED], (SG), O.N. [REDACTED]; Grounding, entrance to Delaware  
Bay on 19 September 1977, with no personnel injuries and no pollution

1. Forwarded, approved.
2. A copy of this report has been forwarded to Commander, Third Coast Guard District (oan).
3. The original form CG-2692 for the [REDACTED] was forwarded with the year-end report.

  
D. W. SMITH  
ex  
(mvs)  
27 October 1977

SECOND ENDORSEMENT

From: Commander, Third Coast Guard District  
To: Commandant (G-MMI-1/83)

1. Forwarded approved.

  
A. N. SCHROEDER  
By direction

Copy to:  
MIO Phila.



DEPARTMENT OF TRANSPORTATION  
UNITED STATES COAST GUARD

RECEIVED

OCT 26 1977

MAINE SAFETY DIV.

MAILING ADDRESS

Officer in Charge  
Marine Inspection  
801 Custom House  
Philadelphia, PA 19106  
(215) 597-4337

16732/MNIS 21879  
18 October 1977

From: Investigating Officer, Philadelphia, PA  
To: Commandant (C-MI-1/83)  
Via: (1) Officer In Charge, Marine Inspection, Philadelphia, PA  
(2) Commander, Third Coast Guard District (mvs)  
Subj: M/V [REDACTED], (SG), O.N. [REDACTED]; Grounding, entrance to Delaware Bay on 19 September 1977 with no personnel injuries and no pollution

1. The investigation of the casualty has been completed; a narrative report will not be submitted.
2. The proximate cause of the casualty was an error in judgement on the part of the Master, in that he underestimated the effect of current on his vessel. The vessel had slowed to 4 to 5 knots to pick up the pilot and was set to the right by the tidal current, grounding softly on the starboard bow, shortly before the pilot arrived on board.
3. The vessel was boarded by personnel of the Marine Inspection Office, Philadelphia, Captain of the Port, Philadelphia, and Atlantic Strike Team. There was no apparent damage and no loss of oil.
4. The vessel was refloated at 1200, 19 September 1977 and continued lightering to Interstate Oil Barge [REDACTED]. The vessel was unable to get underway because a mud-clogged strainer caused the loss of a generator. The vessel regrounded in the same position on the port quarter at 1630. The vessel continued lightering until high water at 0150, 20 September 1977 when the vessel was again afloat. The vessel was moved under its own power and without incident to Big Stone Anchorage in the Delaware Bay.
5. The aids to navigation in the area were checked on 19 September 1977 and were found to be watching properly.
6. The Master's comment in block 34 points to a need for action on the part of the Coast Guard for a change in aiding deep draft vessels entering Delaware Bay. The Master's recommendation would present one approach which might help to reduce the possibility of groundings. An alternative would be to move buoy R "2A", light list number 2095.10, approximately 1.2 miles to the west, which would prevent traffic from being led into the vicinity of the 37 foot shoal area, one mile west of the buoy's current position. This recommendation has the support of the Captain of the Port, and the Mariner's Advisory Committee.

16732/MIS 21879  
18 October 1977

Subj: M/V [REDACTED], (SG), O.N. [REDACTED]; Grounding, entrance to Delaware Bay on 19 September 1977 with no personnel injuries and no pollution

The Master's comment that deep draft tankers should not enter the bay after dark is not concurred with. Pilots routinely bring vessels in without incident. The movement of vessels during periods of poor visibility is already adequately controlled by Navigation Rules.

7. It is recommended that a copy of this report be forwarded to Commander, Third Coast Guard District (oan).

8. There is no evidence of actionable misconduct, inattention to duty, negligence, or violation of law or regulation on the part of licensed or certificated persons, nor evidence that failure of inspected material or equipment, nor evidence that any personnel of the Coast Guard, or any other government agency or any other person contributed to the cause of this casualty. Therefore it is recommended that this casualty investigation be closed.

  
D. J. MARTYN


Encl: (1) COTP 221810 Z Sep 77

72865

DEPARTMENT OF TRANSPORTATION U. S. COAST GUARD CG-2692 (Rev. 12-70)		<b>REPORT OF VESSEL CASUALTY OR ACCIDENT</b>		Form Approved OMB No. 04-R3021 REPORTS CONTROL SYMBOL MVI-4017	
INSTRUCTIONS					
1. An original and two copies of this form shall be submitted, without delay, to the Officer in Charge, Marine Inspection, in whose district the casualty occurred, or in whose district the vessel first arrived after such casualty. 2. If the person making the report is a licensed officer on a vessel required to be manned by such officer, he must make the report in writing and in person to the proper Marine Inspector. If because of distance it may be inconvenient for such an officer to submit the report in person, he may submit the required number of copies by mail. However, to avoid delay in investigations, it is desired that reports be submitted in person. 3. This form should be completed in full; blocks which do not apply to a particular case should be indicated as "NA". Where answers are unknown or none, they should be indicated as such. All copies should be signed. NOTE: (1) Report all deaths and injuries, which incapacitate in excess of 72 hours, on CG-924E whether or not there was a vessel casualty. (2) Attach separate Form CG-924E to this report for each person killed or injured and incapacitated in excess of 72 hours as a result of the vessel casualty reported herein.					
18. Officer in Charge, Marine Inspection, Port of <b>Philadelphia</b>				DATE SUBMITTED <b>19 Sept 1977</b>	
I PARTICULARS OF VESSEL					
1. NAME OF VESSEL <b>[REDACTED]</b>		2. OFFICIAL NUMBER <b>[REDACTED]</b>		3. HOME PORT <b>Singapore</b>	
5. TYPE OF VESSEL (P.M., pass., thr., etc.) <b>tanker</b>		6. PROPULSION (Steam, diesel, etc.) <b>Diesel</b>		7. GROSS TONNAGE <b>51,501</b>	
9. HULL MATERIALS <b>steel</b>		10. YEAR BUILT <b>1974</b>		11. RADIO EQUIPMENT <input checked="" type="checkbox"/> TRANSMIT <input checked="" type="checkbox"/> RECEIVE <input checked="" type="checkbox"/> VOICE <input checked="" type="checkbox"/> CB (Key)	
12. (a) RADAR EQUIPPED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		(b) RADAR OPERATING AT TIME OF CASUALTY: <b>21 Sept 77</b> <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
13. (a) CERTIFICATE OF INSPECTION ISSUED AT PORT OF <b>SOLAS Singapore</b>		(b) DATE CERTIFICATE OF INSPECTION ISSUED <b>2/26/76</b>			
14. (a) NAME OF MASTER OR PERSON IN CHARGE (Indicate which) <b>[REDACTED]</b>		(b) DATE OF BIRTH <b>9/4/30</b>		(c) LICENSED BY COAST GUARD <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
15. (a) NAME OF PILOT (If on board at time of accident) <b>none</b>		(b) PILOT SERVING UNDER AUTHORITY OF LICENSE ISSUED BY <input type="checkbox"/> USCG <input checked="" type="checkbox"/> N/A <input type="checkbox"/> STATE <input type="checkbox"/> FOREIGN			
16. (a) NAME OF OWNER(S), OPERATOR(S) OR AGENT (Indicate which) <b>[REDACTED] owner</b> <b>[REDACTED] operator</b>		(b) ADDRESS OF OWNER(S), OPERATOR(S), OR AGENT <b>Singapore</b>			
II PARTICULARS OF CASUALTY					
17. (a) DATE OF CASUALTY <b>9/19/77</b>		(b) TIME OF CASUALTY (Local or zone) <b>0435 EDT</b>		(c) ZONE DESCRIPTION <input type="checkbox"/> DAY <input checked="" type="checkbox"/> NIGHT <input type="checkbox"/> TWILIGHT	
18. LOCATION OF CASUALTY (Latitude and longitude; distance and TRUE bearing from charted object, dock, anchorage, etc.)  <b>Latitude 38°47.9' Longitude 75° 00.8'</b>					
19. BODY OF WATER (Geographical name) <b>entrance to Delaware Bay</b>		20. RULES OF THE ROAD APPLICABLE <input type="checkbox"/> INLAND <input type="checkbox"/> GREAT LAKES <input type="checkbox"/> WESTERN RIVERS <input checked="" type="checkbox"/> INTERNATIONAL <input type="checkbox"/> OTHER (Specify)			
21. (a) DID CASUALTY OCCUR WHILE UNDERWAY: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO					
(b) IF YES, LAST PORT OF DEPARTURE <b>Ras Tanura, Saudi Arabia</b>		(c) IF YES, WHERE BOUND WHEN CASUALTY OCCURRED <b>Mobil Paulsboro (Philadelphia)</b>			
22. (a) WEATHER CONDITIONS WHEN CASUALTY OCCURRED: <input type="checkbox"/> CLEAR <input type="checkbox"/> PARTLY CLOUDY <input checked="" type="checkbox"/> OVERCAST <input type="checkbox"/> FOG <input type="checkbox"/> RAIN <input type="checkbox"/> SNOW <input type="checkbox"/> OTHER (Specify)					
(b) VISIBILITY (Miles, yds., ft., etc.) <b>2-4 miles</b>		(c) WIND DIRECTION <b>west</b>		(d) FORCE IN KNOTS <b>4 kts</b>	
(e) GUSTY <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		(f) AIR TEMPERATURE <b>22 C</b>			
23. (a) SEA CONDITIONS WHEN CASUALTY OCCURRED <b>light</b>		(b) SEA WATER TEMP (if available) <b>21 C</b>		(c) HEIGHT OF SEA <b>1 to 3 ft.</b>	
(d) DIRECTION OF SEA <b>SW</b>		(e) HEIGHT OF SWELL <b>none</b>		(f) DIRECTION OF SWELL <b>none</b>	
24. (a) NATURE OF CARGO (Specify) <b>light Arabian Crude</b>		(b) AMOUNT OF DRY CARGO (Long tons) <b>NONE</b>		(c) AMOUNT OF BULK LIQUID (Long tons) <b>678,513 bbls</b>	
(d) AMOUNT OF DECK LOAD (Long tons) <b>none</b>					
25. (a) DRAFT FORWARD <b>47' 08"</b>		(b) DRAFT AFT <b>48' 08"</b>			
26. (a) TYPES OF LIFESAVING EQUIPMENT USED, IF ANY <b>none</b>		(b) NO LIVES SAVED WITH LIFE-SAVING EQUIPMENT <b>N/A</b>		(c) LIFESAVING EQUIPMENT SATISFACTORY <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (If no, explain in item 54)	

PREVIOUS EDITION MAY BE USED

(Over)

27 CREW PASSENGERS OTHER(Specify)			28 ESTIMATED LOSS/DAMAGE TO YOUR VESSEL \$ <del>1116</del>	
NUMBER ON BOARD 30 0 0			ESTIMATED LOSS/DAMAGE TO YOUR CARGO \$ <del>1116</del>	
DEAD/MISSING 0			ESTIMATED LOSS/DAMAGE TO OTHER PROPERTY \$ none	
INCAPACITATED (over 3 days)			(Specify whether vessel, dock, bridge, etc.)	
29 NATURE OF THE CASUALTY (Check one or more of the following. Give pertinent details in item 30.)				
COLLISION WITH OTHER VESSEL(S) (Specify)			EXPLOSION/FIRE (Other)	
			<input checked="" type="checkbox"/> GROUNDING	
			FOUNDER (Sinking)	
COLLISION WITH FLOATING OR SUBMERGED OBJECTS			CAPSIZING WITHOUT SINKING	
COLLISION WITH FIXED OBJECTS (Piers, bridges, etc.)			FLOODING SWAMPING ETC WITHOUT SINKING	
COLLISION WITH ICE			HEAVY WEATHER DAMAGE	
COLLISION WITH AIDS TO NAVIGATION			CARGO DAMAGE (No vessel damage)	
COLLISION (Other)			MATERIAL FAILURE (Vessel structure)	
EXPLOSION/FIRE (Involving cargo)			MATERIAL FAILURE (Engineering machinery, including main propulsion, auxiliaries, boilers, evaporators, deck machinery, electrical, etc.)	
EXPLOSION/FIRE (Involving vessel's fuel)				
FIRE (Vessel's structure or equipment)			EQUIPMENT FAILURE	
EXPLOSION (Boiler and associated parts)			CASUALTY NOT NAMED ABOVE	
EXPLOSION (Pressure vessels and compressed gas cylinders)				
30 DESCRIPTION OF CASUALTY (Events and circumstances leading to casualty and present when it occurred. Attach diagram and additional sheets, if necessary)				
<p>Vessel was approaching Delaware Bay through Delaware to Cape Henlopen traffic Lane. The engine was put slow ahead waiting for the pilot at 0425 due south 180°. .9 mile from buoy R2A (radar fix), and course was changed to 292°. Speed at slow ahead is 4 to 5 kts. The strong tidal current set the ship to the right grounding softly at 0435 due west of buoy R 2 A (270) .85 miles. Vessel grounded on Stbd bow. Vessel floated free at 1200. Regrounded at 1600 as tide went out. Vessel at anchor. Generator undergoing repair not related to grounding.</p>				
31 DAMAGE (Give brief general description and state if vessel is a total loss.)				
<p>No apparent damage, pending bottom survey. Sounded forepeak, cofferdams, ballast tanks, took ullage in cargo tanks. No leakage found.</p>				
III ASSISTANCE AND RECOMMENDATIONS				
32 AUTO ALARM TRANSMITTED BY YOUR VESSEL: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				
33(a) ASSISTANCE RENDERED BY STATIONS AND VESSELS (Include Coast Guard and other stations and vessels)			33(b) OTHER ASSISTANCE RENDERED	
<p>Lightering by Interstate Oil barge 140 and tug Ranger</p>			<p>none</p>	
34 RECOMMENDATIONS FOR CORRECTIVE SAFETY MEASURES PERTINENT TO THIS CASUALTY (Include explanation of unsatisfactory lifesaving equipment)				
<p>Recommend that pilots board ship at the end of the traffic lane "DC" buoy. Deep draft vessel with cargo oil should not enter channel to Bay after dark or in poor visibility.</p>				
TITLE Master			SIGNATURE 	

7/355 ✓

16732/C-47-77  
9 August 1977

FIRST ENDORSEMENT on Investigating Officer CG MSO Juneau ltr 16732  
of 22 March 1977

From: Commanding Officer, CG Marine Safety Office, Anchorage, AK  
To: Commandant (G-MMI-1)  
Via: Commander, Seventeenth Coast Guard District (m)

Subj: MV [REDACTED], O.N. [REDACTED]; grounding off East Forelands,  
Cook Inlet, AK., on 5 October 1976, without loss of life.

1. Forwarded approved.
2. MSO Anchorage Case Number C-47-77 has been assigned.
3. A report of violation has been submitted concerning Capt.  
[REDACTED] action in this incident.
4. A Water Pollution Violation Report has been submitted for the  
spill resulting from this casualty.
5. A source-fact letter will be forwarded to OCMI Houston, TX.,  
the port of Captain [REDACTED] last known permanent home address,  
for such action as that office may deem appropriate.

*K. Nichols*  
K. Nichols

Copy to:  
MSO Juneau

16732  
12 August 1977

SECOND ENDORSEMENT

From: Commander, Seventeenth Coast Guard District  
To: Commandant (G-MMI-1)

1. Forwarded approved.
2. Alleged violation is under review.

*V. E. Cox*  
V. E. COX  
By direction



DEPARTMENT OF TRANSPORTATION  
UNITED STATES COAST GUARD

MAILING ADDRESS

Commanding Officer  
Marine Safety Office  
612 Willoughby Ave  
Juneau, Alaska 99801  
TELE: (907) 586-7288

16732  
22 March 1977

From: Investigating Officer, MSO Juneau  
To: Commandant (G-MMI)  
Via: (1) Officer-in-Charge, Marine Inspection, Anchorage, AK  
(2) Commander, Seventeenth Coast Guard District(m)  
Subj: M/V [REDACTED], O.N. [REDACTED]; grounding off East  
Forelands, Cook Inlet, Alaska on 5 October 1976, with-  
out loss of life

FINDINGS OF FACT

1. The M/V [REDACTED] grounded off East Forelands on  
5 October 1976 in the approximate position of 60-48.9N,  
151-29W. As a result of this casualty extensive bottom  
damage was incurred and approximately 9421 bbls of JP-4  
cargo was lost or not accounted for.

2. Vessel data:

NAME	:	[REDACTED]
OFFICIAL NUMBER	:	[REDACTED]
SERVICE	:	TANKER
GROSS TONS	:	17,134.15
NET TONS:	:	11,886
HULL MATERIAL	:	STEEL/WELDED
LENGTH:	:	563.8'
BREADTH	:	84.1'
DEPTH	:	45.7'
PROPULSION	:	OIL SCREW
HORSEPOWER	:	14,000
HOMEPORT:	:	WILMINGTON, DELAWARE
OWNERS	:	[REDACTED] TRUSTEE
MASTER	:	[REDACTED]
LICENSE	:	LICENSE NUMBER [REDACTED], MASTER OF OCEAN STEAM OR MOTOR VESSELS ANY GROSS TONS, RADAR OBSERVER, FIRST CLASS PILOT OF TAMPA AND



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22 March 1977

Subj: M/V [REDACTED], O.N. [REDACTED]; grounding off  
East Forelands, Cook Inlet, Alaska on 5 October 1976,  
without loss of life.

LICENSE(CONT.)	:	HILLSBOROUGH BAYS AT TAMPA FLORIDA, AND FROM JUNCTION OF "K" CUT CHANNEL, FLORIDA POWER CORPORATION PLANT, WEEDEN ISLAND, FLORIDA, AND DELAWARE BAY FROM LEWES, DELAWARE TO CAPE MAY, NEW JERSEY.
USMMD	:	Z-245 539-D2
CERTIFICATE OF INSPECTION	:	ISSUED 18 AUGUST 1976 AT LOS ANGELES, CALIFORNIA

As a result of this casualty the vessel received extensive bottom damage and all cargo tanks were holed with the exception of 3C, 4P, 5P, 6P, 7P, 7C, and 7S. The field survey, conducted in Seattle, Washington by U. S. Salvage, dated October 29, 1976 lists the extent of damages found when the vessel was drydocked (EXHIBIT Z). All repairs were completed to the satisfaction of the Officer-in-Charge, Marine Inspection, Seattle, Washington.

3. The weather at the time of the casualty was as follows: wind northerly force 3 (Beaufort Scale), temperature 50 degrees Fahrenheit, Barometer 29.76, seas slight with a light chop, sky overcast with a light drizzle and visibility 8-10 miles. The tide predictions at 0912 for 5 OCT 76 were taken on Seldovia for East Foreland and was a plus 1.7 feet. The current was taken off Wrangell Narrows for Nikiski and the predicted velocity at 0912 for 5 OCT 76 was 3.344 knots. One radar (3 Centimeter) was operating normally and was in use at the time of the casualty. The other surface radar (10 centimeter) was inoperable. The mate on watch used the radar to obtain ranges and bearings from fixed objects and relied solely on this method to fix the vessels position. All other navigating equipment on the bridge was operating normally. All times used in this report are Alaska Daylight Saving Time (ADST)(+9), unless otherwise indicated. Navigational equipment particulars aboard the vessel are as follows:

RADAR(3cm)  
RAYTHEON SELENIA  
Model 1645/6XB  
16 inch cathode-ray tube  
Built 1972  
True and Relative bearing capability  
Bearing resolution--1% or better  
Range resolution---better than 75 yards

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Subj: M/V [REDACTED], O.N. [REDACTED]; foundering off  
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without loss of life

RADAR(3cm)(CONT.)  
Range Scales-- $\frac{1}{2}$ - $1\frac{1}{2}$ -3-6-12-24-48 miles

RADAR(10cm)  
RAYTHEON SELENIA  
Model 1660/12SB  
16 inch cathode-ray tube  
Built 1972  
True and Relative bearing capability  
Bearing resolution--1% or better  
Range resolution--better than 75 yards  
Range Scales-- $\frac{1}{2}$ - $1\frac{1}{2}$ -3-6-12-24-48 miles

LORAN--ITT MACKAY Model 4207 with "A" and "C" capability

Radio Direction Finder--ITT MACKAY Model 4004

OMEGA--SPERRY Model SR-500

4. The M/V [REDACTED] commenced the voyage at San Pedro, California on 26 SEP 76. As was the usual practice, the vessel engaged and embarked a pilot for the waters expected to be traversed prior to departure. For this specific trip the vessel engaged Captain [REDACTED]. Captain [REDACTED] holds U. S. Coast Guard license number [REDACTED] endorsed as Master, Ocean Steam or Motor vessels of any gross tons: Radar Observer; Also First Class Pilot of the waters of Southeastern and Southwestern Alaska. This license was issued to Captain [REDACTED] on 19 OCT 73 in Seattle, Washington and is valid for a period of five years. Captain [REDACTED] also holds a State of Alaska, Department of Commerce, license which states on the face:  
"This certifies that [REDACTED] has fulfilled all the requirements of the laws of Alaska, and possessing the prescribed qualifications, is hereby authorized to practice as a marine pilot of the Southeastern and Southwestern Inland Waters in the State of Alaska, any gross ton." This license expired on December 31, 1976.

5. The first port of call was Kodiak, Alaska where the vessel discharged a partial load of JP-5 jet fuel cargo. The vessel, having completed discharging cargo at Kodiak, had 18 of the 21 cargo tanks filled. The three empty tanks were number fours across. The M/V [REDACTED] departed Kodiak at about 0930 on 4 OCT 76 and was bound for the Tessoro Pet Company Terminal at Nikiski, Alaska and had approximately 175,000 bbls of cargo remaining on board. The vessel's draft reading just prior to departure was 27 feet 2 inches forward, 32 feet 9 inches aft. The master estimated burnoff and water

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usage in any 24 hour period would not exceed one (1) inch per day. The purpose of the call at Nikiski was to load 25,000 bbls of diesel. After the vessel had taken departure at Kodiak and was outside pilot waters, Captain [REDACTED], the pilot, was relieved of all navigating responsibilities by other ship's officers. As was discussed between the master, Captain [REDACTED], and the pilot, Captain [REDACTED], it was determined the vessel was to proceed at slow speed with one engine (Starboard) in order to arrive alongside the pier at Nikiski at about 1000. This would be approximately low slack water on the morning of the 5th of October 1976. During the course of this conversation the pilot requested that he be permitted to anchor the vessel before going into Nikiski because of the long period of time his services would be required. The Master, Captain [REDACTED], told Captain [REDACTED] this would not be possible. The master advised that union regulations required the vessel to provide a liberty launch if they anchored. Condescending to the Masters wishes, Captain [REDACTED] agreed to remain on watch and take the vessel into Nikiski even though the watch would be more than 8 consecutive hours.

6. The vessel proceeded without incident and at 0110 on the 5th of October 1976 Captain [REDACTED] again assumed the con of the vessel upon entering pilot waters. The vessel progressed into Cook Inlet and at about 0800 the third mate, Mr. [REDACTED], relieved the mate on watch and noted that Captain [REDACTED] was conning the vessel. Mr. [REDACTED] fixed the vessel's position at 0806 by using a radar range and bearing. At 0825 another engine was placed on the line to speed up the vessel and provide sufficient power for maneuvering the vessel when coming alongside the berth at Nikiski. With both engines on the line the vessel was placed in the cruise mode which gave the vessel full speed of 16 knots.

7. Captain [REDACTED] came on the bridge at about 0845 and looked at the position that had just been plotted by Mr. [REDACTED]. The master conversed with the pilot concerning the arrival time and directed the Chief Engineer to provide the water and fuel report so that it could be included in the arrival message. It was the master's intention to take arrival at 0930. The master drafted a message after obtaining the essential information and decided he would personally take the message to the radio-room in view of the time remaining before he would be needed on the bridge. The master in Kodiak, and again on the morning of 5 October directed Mr. [REDACTED] to pay specific and particular attention to the pitch control when the vessel began to maneuver. The purpose of this was to observe any malfunction in the pitch control immediately in order that

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corrective action could be taken in time to avoid any casualties. The pitch control had previously malfunctioned during the approach to Kodiak and the master wanted to avoid a repeat of this incident. The Chief Engineer repaired the previous minor malfunction in the system and there had not been a recurrence since the Kodiak incident. Captain [REDACTED] order to pay particular attention to the pitch controls required the mate on watch to be in almost constant attendance at the pitch control panel. As a consequence, the mate had little time available for other required navigational duties. Having given specific instruction, and drafting the message, the Master proceeded below to the radio-room at about 0900 to deliver the arrival report.

8. At about 0906, when buoy 2 was just abaft the beam, the pilot, Captain [REDACTED], ordered the helm to be put right 15 degrees. When the vessel had changed course from about 010 degrees (GYRO) to about 060 degrees (GYRO) the pilot ordered the helmsman to steady-up. When the helmsman called out 064 degrees the pilot ordered the helmsman to hold course. This course was maintained for approximately 6 minutes when the pilot gave the order to come right with 15 degrees rudder and to come to a heading of 090 degrees (GYRO). When the vessel was passing about 080 degrees the vessel began to vibrate. The helmsman described the vibration as feeling the engines or the pitch control had reversed. The helmsman visually observed the pitch control and revolution gages and both appeared to be normal. Having observed this, his first impression was that the vessel had run aground. Approximately 30 seconds or less after the first vibrations, the vessel again started to shudder and at this time the helmsman was positive the vessel had grounded. The vessel came to a stop a short time later and the Mate on watch Mr. [REDACTED], directed the helmsman to put the rudder amidships. The helmsman noted the vessel had reached approximately 085 degrees (GYRO) and more or less steadied up on this heading after the vessel had come to a complete stop. The mate, Mr. [REDACTED], noted a strong smell of cargo (JP-4) and observed a black streak in the water up forward on the port side and also noted the surrounding water was somewhat discolored which he assumed to be the vessels cargo (JP-4). Having observed the water and smelled the strong odor of the vessel's cargo, the mate directed the helmsman to leave his post and proceed below to tell the cook and other crewmembers to put out any cigarettes or open fires and to secure the galley. He was also to advise other crewmembers that cargo had spilled and to exercise all necessary precautions to prevent a fire or explosion.

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9. Captain [REDACTED], who was at the radio-room with the Chief Engineer, felt the vibrations and proceeded immediately to the wheelhouse. The Chief Engineer noting the same vibration departed immediately to the engineroom. Upon arrival in the wheelhouse, the master inquired as to what had happened and assumed control of the vessel's operations. Captain [REDACTED] noticed the engines were stopped but were still engaged and that the vessel had taken a pronounced starboard list and had reached an attitude of almost 12 degrees. Captain [REDACTED] simultaneously pushed the appropriate buttons to disengage the engines and called the engineroom to confirm the engines were not engaged. Having spent a few moments assessing the situation, the master went to the port wing of the bridge and noticed a black streak in the water up forward and also noted the strong, pungent odor of the vessel's cargo. Having briefly assessed the situation, Captain [REDACTED] directed the Chief Mate and the pumpman to commence gravitating cargo into number four port tank. The purpose of this was to ascertain if the cargo lines were still intact and to take the list off the vessel. A short time after gravitation began and the lines were found intact, the master ordered the cargo pump started to transfer oil to number four port tank. After about 20 minutes enough cargo had been transferred to bring the vessel back to an approximate even keel. The master then directed the third mate, Mr. [REDACTED], to obtain a bearing and distance from East Forelands Light and directed the radio operator to notify the U. S. Coast Guard in Anchorage, Alaska of the casualty and of the pollution. At about this same time, the master noted the vessel was going down by the head as he was attempting to level the vessel. He then ordered that soundings be taken of all tanks and spaces to better assess the damages. It was reported that NO4C and NO4S were holed and taking on water. The master calculated this flooding of empty tanks is what caused the vessel to be down by the head. At about this same time, 0930, Mr. [REDACTED] advised the master the vessel was drifting and had way on. Captain [REDACTED] continued with his damage control efforts for a short time and at 0957 ordered the port anchor let go. A fix of the vessel's position at the time of anchoring was 60-51.5N, 151-27.8W.

10. The pilot, Captain [REDACTED], had been on watch continuously since 0110 in the morning without any relief whatsoever. Captain [REDACTED] testified that he had had much previous experience in the area and was very familiar with all of the surroundings and waters. While Captain [REDACTED] was piloting he last noted the radar at about 0705 in the morning and more or less took a range off Kalgin Island and noted the vessel was about 4.5 miles distant. Based on his experience in the area and his

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local knowledge, the pilot also testified that he had not used the chart and was relying solely on seaman's eye as his means of fixing the vessels position. Captain [REDACTED] stated the position placed on the chart by the third mate Mr. [REDACTED], at 0906 was in error. Captain [REDACTED] did not question any other position placed on the chart by Mr. [REDACTED] and assumed they were all correct. Captain [REDACTED] offered into testimony exhibit AA which was chart 16660. On this exhibit Captain [REDACTED] had drawn a reconstructed course line from the 0845 position to a 0901 position. In his reconstruction, it brought the vessel's position, with a course of 010 degrees True, to the point where the vessel made its turn at time 0901. Captain [REDACTED] reconstruction of the trackline placed the vessel in good water and clear of the known charted shoal area. However, upon further inquiry and reconstructing the vessel's position and a trackline a second time and using the vessel's speed of 16 knots, which previous testimony stated the maximum speed of the vessel to be, and using a current of 2 knots, which the vessel would have to stem and which approximated the actual conditions encountered, this second reconstruction of the vessel's trackline by Captain [REDACTED] caused the trackline to traverse over the known and charted shoal area. The depths of water in this known shoal area range from 24 feet to 30 feet at Mean Lower Low Water (MLLW).

11. The vessel having anchored, commenced pollution and damage control efforts. A lightering operation was set up to discharge the remaining cargo aboard the vessel. After a concerted effort on the part of ship's personnel, assisting agencies, owners and other persons, it was ascertained that all cargo had been recovered with the exception of about 9421 bbls which either spilled into Cook Inlet or was otherwise not accounted for. There was no apparent visible damage to the environment as a result of this spill. However, efforts are still ongoing by appropriate agencies to evaluate the affects this spill may have caused.

12. Having completed all lightering operations satisfactorily, the vessel, using the ship's own propulsion and in escort of tugs, departed Nikiski at about 1042 GMT on the 18th of October 1976 bound for Resurrection Bay off Seward, Alaska. The purpose of proceeding to this area was to get into clear water, since Cook Inlet is heavily silted. This would then enable divers to obtain a more unobstructed view of damages and permit responsible persons to evaluate the hull girder for seaworthiness.

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#### CONCLUSIONS

1. It is concluded the M/V [REDACTED] grounded in the approximate position of 60-42.9N, 151-29W.
2. It is concluded the cause of this casualty was the pilot's failure to correctly and accurately ascertain in the vessel's position as well as take into consideration the effects of the current, while making an approach to Nikiski. By such failure, a course change was initiated which took the vessel over a known and charted shoal area.
3. Contributory to this casualty was the fatigue of the pilot from having stood watch for over 8 continuous hours without relief.
4. Contributory to this casualty was the mate's compliance with the Master's order to pay particular attention to the pitch controls and to the extent that almost all other navigating duties were excluded.
5. It is concluded the vessel grounded twice and came to a complete stop and was hard aground after the second grounding.
6. It is concluded that Captain [REDACTED] did not take into consideration the affects the current had on the vessel and therefore anticipated the vessel was north of the actual position at the time the turn toward Nikiski was made.
7. It is further concluded that the position at 0901, as reconstructed by Captain [REDACTED], was in error because Captain [REDACTED] allowed a speed of 18 knots through the water when the approximate actual conditions encountered was 14 knots or less.
8. It is concluded that the ballasting of the vessel by the master in order to place the vessel on an even keel, combined with the effects of the wind and current, caused the vessel to become adrift.
9. The master used poor judgment when he ordered ballasting the vessel without first having completed a full damage survey. Had there been additional damage to the vessels stability the

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vessel would in all probability have come adrift and sunk.

10. The pilot, Captain [REDACTED], was operating under the authority of his Alaska State Pilots License in that the vessel was sailing under register.

11. There is evidence of negligence on the part of the master in that he failed to provide sufficient personnel on the bridge to safely navigate the vessel in that he ordered the mate to watch the pitch control to the almost absolute exclusion of other navigating duties.

12. There is evidence of negligence on the part of the master in that he failed to provide sufficient relief for the pilot or otherwise stop the vessel to provide relief and rest.

13. There is evidence of negligence on the part of the pilot in that he failed to correctly and accurately ascertain the vessel's position prior to commencing the approach to Nikiski thereby taking the vessel over a known charted shoal area.

14. There is evidence of violation of 33 USC 1321 in that about 9421 bbls of petroleum was spilled into Cook Inlet as a result of this casualty.

15. There is no evidence that any person of the Coast Guard, or any other government agency or any other persons contributed to the casualty.

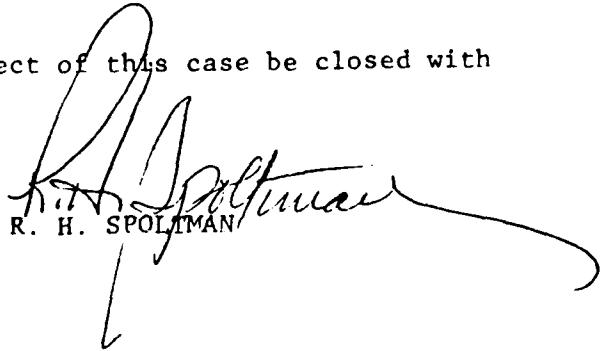


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out loss of life.

RECOMMENDATIONS

1. It is recommended that further investigation under the Suspension and Revocation Proceedings be initiated in the case of Captain [REDACTED] concerning his part in the casualty.
2. Recommend that evidence of negligence on the part of the Pilot Captain [REDACTED] be processed under the Administrative Penalty Procedures.
3. Recommend the casualty aspect of this case be closed with the submission of this report.

  
R. H. SPOLTMAN

LIST OF ENCLOSURES AND DISTRIBUTION FOR IO, MSO JUNEAU LTR  
16732 DTD 22 MAR 77

Encl: (1) CG-2692  
(2) Convening Order  
(3) Verbatim testimony of witnesses (except Captain [REDACTED])  
(4) Verbatim testimony of Captain [REDACTED]  
(5) Exhibits (A through AA--xerox copy)  
(6) Vessel Certificate of Inspection (xerox copy)  
(7) Vessel Document (xerox copy)  
(8) Copy of order to Testify and Grant of Immunity

Distribution:  
MSO Anchorage w/encl (1)  
CCGD17(m) w/o encl (1)  
COMDT (G-MMI) w/encl (4)

## ENCLOSURE 1

DEPARTMENT OF TRANSPORTATION U. S. COAST GUARD CG-2092 (Rev. 12-70)		<b>REPORT OF VESSEL CASUALTY OR ACCIDENT</b>		Form Approved OMB No. 04-R3002 REPORTS CONTROL SYMBOL MVI-4017	
INSTRUCTIONS 1. An original and two copies of this form shall be submitted, without delay, to the Officer in Charge, Marine Inspection, in whose district the casualty occurred, or in whose district the vessel first arrived after such casualty. 2. If the person making the report is a licensed officer on a vessel required to be manned by such officer, he must make the report in writing and in person to the proper Marine Inspector. If because of distance it may be inconvenient for such an officer to submit the report in person, he may submit the required number of copies by mail. However, to avoid delay in investigations, it is desired that reports be submitted in person. 3. This form should be completed in full; blocks which do not apply to a particular case should be indicated as "NA". Where answers are unknown or none, they should be indicated as such. All copies should be signed. NOTE: (1) Report all deaths and injuries, which incapacitate in excess of 72 hours, on CG-924E whether or not there was a vessel casualty. (2) Attach separate Form CG-924E to this report for each person killed or injured and incapacitated in excess of 72 hours as a result of the vessel casualty reported herein.					
TO: Officer in Charge, Marine Inspection, Port of <u>ANCHORAGE, ALASKA</u>				DATE SUBMITTED <u>OCTOBER 18, 1976</u>	
<b>I PARTICULARS OF VESSEL</b>					
1 NAME OF VESSEL <u>[REDACTED]</u>	2 OFFICIAL NUMBER <u>[REDACTED]</u>	3 HOME PORT <u>WILMINGTON, DEL.</u>	4 NATIONALITY <u>USA</u>		
5 TYPE OF VESSEL (Pri., pass., etc.) <u>MOTOR TANKER</u>	6 PROPULSION (Steam, diesel, etc.) <u>DIESEL</u>	7 GROSS TONNAGE <u>1713.15</u>	8 REGISTERED LENGTH OR L O A <u>587 Ft.</u>		
9 HULL MATERIALS <u>STEEL</u>	10 YEAR BUILT <u>KEEL 1972</u>	11 RADIO EQUIPMENT <input checked="" type="checkbox"/> TRANSMIT <input checked="" type="checkbox"/> RECEIVE <input checked="" type="checkbox"/> VOICE <input checked="" type="checkbox"/> CW (Key)			
12 (a) RADAR EQUIPPED <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		(b) IF YES, RADAR OPERATING AT TIME OF CASUALTY <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
13 (a) CERTIFICATE OF INSPECTION ISSUED AT PORT OF <u>LONG BEACH, CA.</u>		(b) DATE CERTIFICATE OF INSPECTION ISSUED <u>9/24/76</u>			
14 (a) NAME OF MASTER OR PERSON IN CHARGE (Indicate which) <u>[REDACTED]</u>		(b) DATE OF BIRTH <u>AUGUST 31, 1923</u>	(c) LICENSED BY COAST GUARD <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
15 (a) NAME OF PILOT (If on board at time of accident) <u>CAPT. [REDACTED]</u>		(b) PILOT SERVING UNDER AUTHORITY OF LICENSE ISSUED BY <input checked="" type="checkbox"/> USCG <input checked="" type="checkbox"/> STATE <input type="checkbox"/> FOREIGN			
16 (a) NAME OF OWNER(S), OPERATOR(S) OR AGENT (Indicate which)		(b) ADDRESS OF OWNER(S), OPERATOR(S), OR AGENT			
<b>II PARTICULARS OF CASUALTY</b>					
17 (a) DATE OF CASUALTY <u>05 OCT. 1976</u>	(b) TIME OF CASUALTY (Local or GMT) <u>APPROXIMATELY 0915/18</u>	(c) ZONE DESCRIPTION <u>Z.D. 9</u>	(d) TIME OF DAY <input checked="" type="checkbox"/> DAY <input type="checkbox"/> NIGHT <input type="checkbox"/> TWILIGHT		
18 LOCATION OF CASUALTY (Latitude and longitude; distance and TRUE bearing from charted object; dock; anchorage, etc.) <u>EAST OF EAST FORELAND, NIKISKI, ALASKA ONE TO TWO MILES</u>					
19 BODY OF WATER (Geographical name) <u>COOK INLET, AK.</u>	20 RULES OF THE ROAD APPLICABLE <input checked="" type="checkbox"/> INLAND <input type="checkbox"/> GREAT LAKES <input type="checkbox"/> WESTERN RIVERS <input type="checkbox"/> INTERNATIONAL <input type="checkbox"/> OTHER (Specify)				
21 (a) DID CASUALTY OCCUR WHILE UNDERWAY: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO					
(b) IF YES, LAST PORT OF DEPARTURE <u>KODIAK, ALASKA</u>		(c) IF YES, WHERE BOUND WHEN CASUALTY OCCURRED <u>PHILLIPS DOCK, NIKISKI, AK.</u>			
22 (a) WEATHER CONDITIONS WHEN CASUALTY OCCURRED: <input checked="" type="checkbox"/> CLEAR <input type="checkbox"/> PARTLY CLOUDY <input checked="" type="checkbox"/> OVERCAST <input type="checkbox"/> FOG <input type="checkbox"/> RAIN <input type="checkbox"/> SNOW <input type="checkbox"/> OTHER (Specify)					
(b) VISIBILITY (Miles, yds., ft., etc.) <u>APPROXIMATELY 8 MILES</u>	(c) WIND DIRECTION <u>N'LY</u>	(d) FORCE IN KNOTS <u>1)</u>	(e) GUSTY <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	(f) AIR TEMPERATURE <u>XX 48</u>	
23 (a) SEA CONDITIONS WHEN CASUALTY OCCURRED <u>small N'LY</u>	(b) SEA WATER TEMP (If available) <u>47</u>	(c) HEIGHT OF SEA <u>ONE FOOT</u>	(d) DIRECTION OF SEA <u>N'LY</u>	(e) HEIGHT OF SWELL <u>ONE FOOT</u>	(f) DIRECTION OF SWELL <u>N'LY</u>
24 (a) NATURE OF CARGO (Specify) <u>JP-4 JET FUEL</u>	(b) AMOUNT OF DRY CARGO (Long tons) <u>NA</u>	(c) AMOUNT OF BULK LIQUID (Long tons) <u>APPROXIMATELY 22,400</u>	(d) AMOUNT OF DECK LOAD (Long tons) <u>NA</u>		
25 (a) DRAFT (Feet and inches) <u>27 FT. 00 INCHES</u>		(b) DRAFT (Feet and inches) <u>27 FT. 00 INCHES</u>			
26 (a) TYPES OF LIFESAVING EQUIPMENT USED, IF ANY <u>NA</u>		(b) NO LIVESAVED WITH LIFESAVING EQUIPMENT <u>NA</u>		(c) LIFESAVING EQUIPMENT SATISFACTORY <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO (If no, explain in item 34)	

PREVIOUS EDITION MAY BE USED

(Over)



DATE  
FILMED  
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